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AN ANALYSIS OF THE TEACHER-PUPIL VERBAL INTERACTION IN SPECIAL CLASSES FOR THE MENTALLY RETARDED.

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The study analyzed teacher-pupil interaction in the classes of nine experimental (E) and eight control (C) teachers and their 167 mentally retarded pupils (mean age = 10.2, mean IQ = 68.76) The E-teachers were given 32 training sessions in an experimental curriculum and the inductive teaching method. Classes were tape recorded for 1 day. Analysis indicated that the distribution of the E-teachers' questions was cognitive-memory (887), evaluative thinking (57), convergent thinking (47), and divergent thinking (37). Significantly more (.001 level) cognitive-memory questions were asked by the teachers than any of the other three types of questions. A comparison of the experimental and control groups demonstrated that E-teachers did not ask significantly more productive thinking or ask for significantly more evaluations after the students' incorrect answers than C-teachers, (2) there was less consistency for E-teachers' questions irrespective of subject matter areas, and (3) there were no significant differences between the E- and C-teachers' statements in the categories studied. Additional data on teacher and student characteristics are considered. Appendixes describe the Gallagher-Aschner Classification System and provide samples of teacher-pupil interactions demonstrating aspects of the inductive method. (JD)

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February, 1967

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CHAPTER I

INTRODUCTION

The term "education" in the phrase special education of the educable mentally retarded denotes an interaction between the mentally retarded pupil and his teacher. However, research has concentrated solely on the study of the mentally retarded pupil, and has completely neglected the performance of the teacher. If special education is to profit from educational research, then the special class teacher, the retarded pupil, and their verbal interactions must be investigated.

To many, the word "special" in the phrase special education for the educable mentally retarded has come to connote an acceptance of the assumption of the educability of intelligence. As a result, new teaching methods and curricula designed to enhance the mentally retarded child's intelligence are being advocated. As the methods and curricula are implemented by the teacher, she is delegated the responsibility for modifying the child's intelligence. Consequently, descriptive research on how the teacher assumes this responsibility is of importance for special education.

New teaching methods for the mentally retarded, like all teaching methods in education, must be evaluated in terms of how well they achieve the goals they seek to achieve. The traditional design used in evaluating teaching methods, the pre-test post-test design, involves testing a group of students, teaching one half of the group by one method and the other half by another method, and then re-testing the students. If any differences between the groups are found, they are attributed to the teaching methods. Implicit in this design is the assumption that the teachers, who are purportedly using a particular method, are actually behaving in similar ways. This assumption is difficult, if not impossible, to justify. To evaluate a teaching method, it first is necessary to determine if and how the teaching method is being carried out by the teacher. This can only be accomplished by observing the teacher-pupil interactions in the classroom. In other words, it is necessary to analyze the process of teaching before the products of a teaching method can be evaluated. A research design analyzing the teaching process has not been used to evaluate any teaching method heretofore.

Although the characteristics of the mentally retarded have been studied extensively, they have not been related to the retarded child's classroom performance. Background characteristics of teachers of the mentally retarded have neither been studied nor related to the teacher's verbal interactions with her students.

Statement of the Problem

This study was undertaken to examine three problem areas.

1. To describe teacher-pupil verbal interactions in special classes for the mentally retarded with special reference to how the teacher uses her language to promote productive thinking in her students.

2. To compare teacher-pupil verbal interactions of teachers instructed in the use of a teaching method designed to enhance productive thinking in the mentally retarded with teachers using other methods.

3. To investigate the effects of teacher and student background characteristics on the teacher-pupil verbal interactions in special classes for the mentally retarded.

CHAPTER II

BACKGROUND OF THE PROBLEM

Theoretical Framework

Guilford's "structure of intellect"

The need for a theoretical framework to organize the vast amount of complex data resulting from an analysis of the teacher-pupil verbal interaction has been voiced by Spaulding (1962). Inasmuch as this study focused on the intellectual aspects of the teacher-pupil interaction, it seemed necessary to employ a theory of intelligence. Such a theory had to be multi-dimensional because of the many different aspects of intelligence which might be evidenced in the classroom. Guilford's "structure of intellect" (1956) was adopted as the theoretical framework of this study because it provided a systematic, comprehensive model of cognitive functioning.

Guilford developed his "structure of intellect" from a series of factor analytic studies of gifted adults. The Guilford model has three major dimensions: the content or broad classes of information; the products or the forms that information take in the organism's processing of it;

and the operations or the major kinds of intellectual activities or processes.

Guilford and Hoepfner (1963) defined four types of content, six types of products, and five types of operations as follows.

CONTENTS

1. Figural content -- Information in concrete form, as perceived or as recalled in the form of images. The term "figural" implies some degree of organization or structuring. Different sense modalities may be involved, e.g., visual, auditory, kinesthetic.

2. Symbolic content -- Information in the form of signs, having no significance in and of themselves, such as letters, numbers, musical notations, and other "code" elements.

3. Semantic content -- Information in the form of meanings to which words commonly become attached, hence most notable in verbal thinking and in verbal communication.

4. Behavioral content -- Information, essentially non-verbal, involved in human interactions, where awareness of the attitudes, needs, desires, moods, intentions, perceptions, thoughts, etc. of other persons and of ourselves

is important.

PRODUCTS

1. Units -- Relatively segregated or circumscribed items of information having "thing" character. May be close to Gestalt psychology's "figure on a ground."

2. Classes -- Recognized sets of items of information grouped by virtue of their common properties.

3. Relations -- Recognized connections between units of information based upon variables or points of contact that apply to them.

4. Systems -- Organized or structured aggregates of items of information; complexes of interrelated or interacting parts.

5. Transformations -- Changes of various kinds of existing or known information or in its use.

6. Implications -- Extrapolations of information, in the form of expectancies, predictions, known or suspected antecedents, concomitants, or consequences.

OPERATIONS

1. Cognition -- Immediate discovery, awareness, rediscovery, or recognition of information in various forms; comprehension or understanding.

2. Memory -- Retention or storage, with some degree of availability, of information in the same form in which it was committed to storage and in response to the same cues in connection with which it was learned.

3. Divergent thinking -- Generation of information from given information, where the emphasis is upon variety and quantity of output from the same source. Likely to involve what has been called transfer. This category has frequently been equated with creativity.

4. Convergent thinking -- Generation of information from given information, where the emphasis is upon achieving unique or conventionally accepted best outcomes. It is likely that given (cue) information fully determines the response.

5. Evaluative thinking -- Reaching decisions or making judgments concerning the goodness (correctness, suitability, adequacy, desirability, etc.) of information in terms of criteria of identity, consistency, and goal satisfaction.

The resulting three-dimensional model pictured in Fig. 1 has 120 cells representing 120 separate abilities. Heretofore, Guilford (1966) has identified 80 of the 120 hypothesized abilities.

The application of Guilford's model to the present study

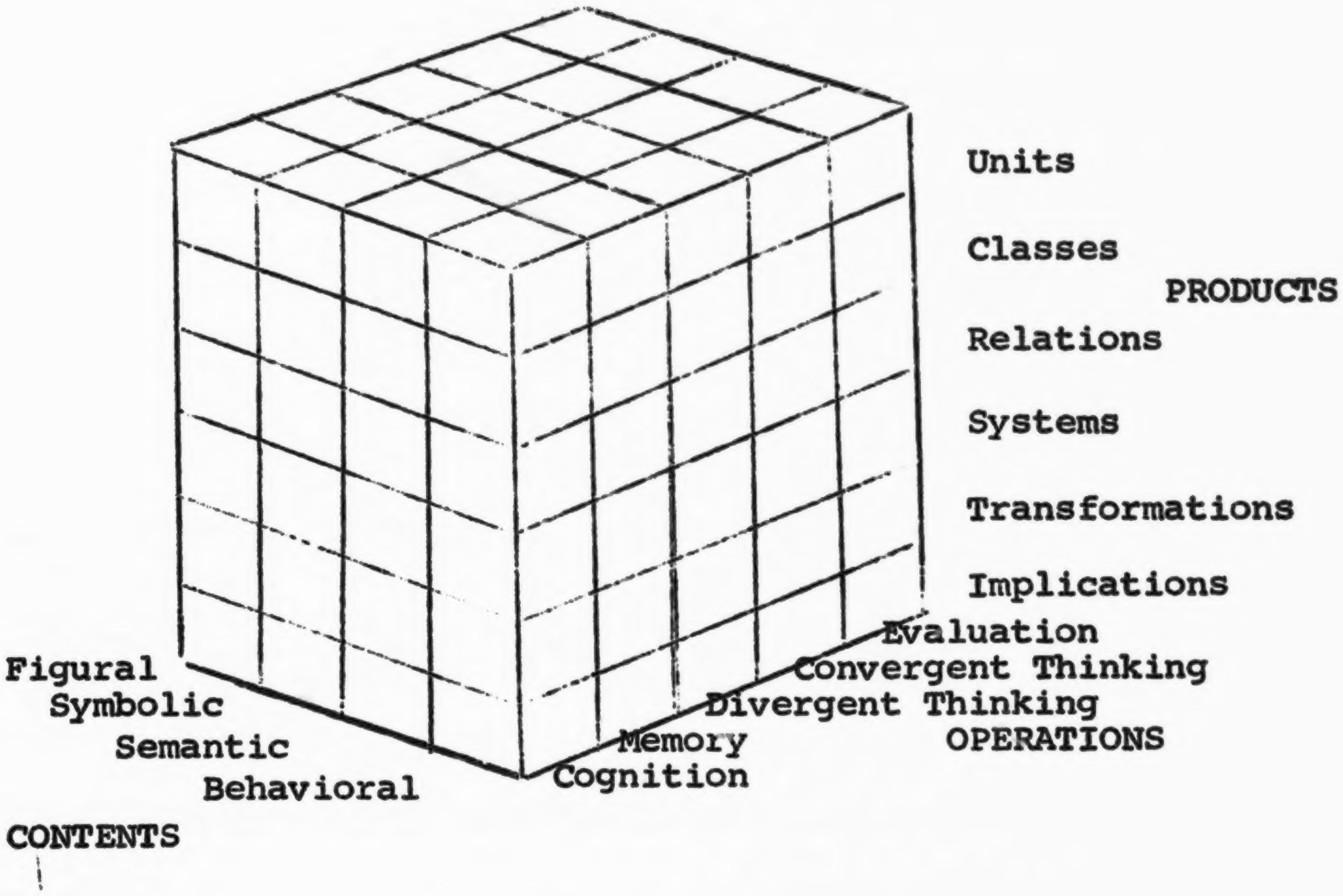
The operations dimension of this model received major emphasis in the present study. Furthermore, for the purposes of this study productive thinking was defined as Guilford's evaluative, convergent, and divergent thinking operations. The teacher's attempts at modifying her mentally retarded pupil's intelligence were equated with her attempts at enhancing his productive thinking.

Since Guilford's model was developed with gifted adults, its suitability for the mentally retarded children used in this study may be questioned. Guilford (1956) and Meyers and Dingman (1966) have stated that children and the mentally retarded have structures of intellect; however, they are simpler than those of adults and normals. Some of the abilities from Guilford's model have been identified in the mentally retarded by Meyers, Dingman, Orpet, Sitkei, and Watts (1964) and in pre-schoolers and infants by Stott and Ball (1963).

Heretofore, there has been no research on the times of emergence of the five operations. However, Meyers and Dingman (1966) have posited the following developmental

Figure 1

Theoretical Model for the Complete "Structure of Intellect"[a]


Units
Classes
PRODUCTS
Relations
Systems
Transformations
Implications
Evaluation
Convergent Thinking
Divergent Thinking
OPERATIONS
Memory
Cognition
Figural
Symbolic
Semantic
Behavioral
CONTENTS

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[a] Guilford, 1959.

order: cognition, memory, divergent thinking, convergent thinking, and evaluative thinking. Wallach and Kogan (1965) also hypothesized that divergent thinking precedes convergent thinking developmentally because of a possible relationship of the former with children's play.

Inasmuch as a simpler model has not yet been developed for the mentally retarded or for children, Guilford's "structure of intellect" was applied inferentially to the mentally retarded children of this study. However, this model was viewed as a general guideline for organizing the data rather than a strict representation of the structure of intellect of mentally retarded children.

Research on Classroom Interaction

Studies of the social-emotional aspect of classroom interaction

The dimension of classroom interaction that has been studied most frequently and most successfully has been the social-emotional climate (Medley and Mitzel, 1963). The forerunners of such classroom interaction studies were social psychologists such as Bales (1951) who observed small group social interactions. Anderson's studies on dominative and integrative teaching patterns pioneered such research in the classroom (1939). Dominative behavior was defined as rigid and coercive while integrative behavior was flexible and democratic. Anderson found that pupils showed more initiative and spontaneity with integrative teachers and were more distractible with dominative teachers. Following Anderson's lead many researchers have studied dominative and integrative behaviors under different labels, and most have had similar findings to Anderson's with respect to pupil performance under the two types of teacher control.

Withall (1956) derived a climate index to reflect the degree to which a teacher was learner-supportive (integrative) or teacher-supportive (dominative). Although Lewin, Lippitt, and White's study (1939) on the effects of authoritarian and democratic leadership was conducted in the laboratory, their findings confirmed Anderson's. In her study comparing teachers judged by administrators as good and those as not good, Hughes (1959) found that 80% of each of the groups were dominative in the majority of activities. Flanders' interaction analysis is the most sophisticated technique for observing classroom climate (Medley and Mitzel, 1963). Flanders' study on the effects of direct (dominative) and indirect (integrative) patterns of teacher influence yielded results similar to Anderson's (Amidon and Flanders, 1963). However, Amidon and Giammatteo (1965), using the Flanders system, found opposing results to those of Hughes. They found that teachers recommended by administrators as good were more indirect than teachers randomly selected.

Spaulding (1962) did not confirm Anderson's findings as he found no relationship between classroom climate and pupil self concept, academic achievement, and creativity. In their study with emotionally disturbed children Cohen, Lavietes, Reens, and Rindsberg (1964) found no differences in the therapeutic and educational effects of two teachers who created very different emotional climates.

A multi-dimensional approach that considers the three variables of emotional climate, verbal emphasis, and social structure has been developed by Medley and Mitzel (1963). These authors criticized their own observational scale (called OScaR) because it failed to examine the cognitive aspect of classroom interaction which they believed to be more important than the social-emotional aspect. Smith (1962) voiced the previous criticism of classroom climate studies as well as an additional two. He believes that these studies have been concerned with the grosser elements of teaching behavior, and that it is not possible to type teaching behavior into general categories because pure types rarely, if ever, occur.

Studies of the intellectual aspect of classroom interaction

In addition to Smith, others have appreciated the importance of the intellectual aspect of classroom interactions; and consequently, there has been a recent up-surge in research in this area. Smith and Meux (1963) conducted the first study in this area; and thus they sought to identify and describe the cognitive dimension of classroom interaction, rather than attempting any experimental manipulations. They distinguished between strategies or the teacher's large scale plans for attaining certain goals for her students and tactics which comprise strategies and are the moment-to-moment moves to manipulate and control the subject matter. Smith and Meux investigated the tactics of teaching or the logical operations of classroom discourse. They tape-recorded 85 class sessions of 17 high school teachers in four different subject matters. They they analyzed the tape-scripts into two basic units: the monologue or a solo performance by one speaker and the episode or the verbal interchange between two speakers. Episodes were found to contain opening, continuing, and closing phases. They constructed 13 categories to analyze the opening phase of episodes. Differences in logical operations were found from teacher to teacher and from subject matter to subject matter.

Using Piaget as a theoretical model, Taba, Levine, and Elzey (1964) constructed a classification system with the basic categories of pedogogical function and level of thought. The authors trained 20 elementary school teachers to use a social studies curriculum and teaching strategies designed to develop cognitive skills. They tape-recorded each class four times over the school year. Their findings were:

1. The pupil characteristics of I.Q., social status, achievement in social studies, and reading comprehension were not correlated with the level of thought expressed in the classroom discussion. They concluded that their hypothesis that slow learners are capable of abstract thinking with good teaching and a good curriculum was confirmed. This conclusion can be questioned on the basis of the following methodological criticisms of the Taba et al. study: no control group was used; the tapescripts were coded by only one judge; and an unspecified number of low I.Q. children who never talked were not included in the analysis.

2. The way the teacher asked questions was the most influential teaching act because it circumscribed the mental operations the students performed.

Bellack, Hyman, Smith, and Kliebard (1965) have employed Wittgenstein's concept of language games to describe the cyclical patterns or combinations of pedogogical moves. Their classification system consists of three dimensions: pedogogical moves which are structuring, soliciting, reacting, and responding; content; and emotional tone. From their study of 15 high school teachers of social studies classes they found:

1. Teachers dominate the verbal activities of the classroom.

2. The teacher's role is to structure, solicit, and react while the pupil's role is limited to responding.

3. The cycles of teacher soliciting-pupil responding-teacher reacting and teacher-soliciting-pupil responding accounted for half of all teacher cycles.

Currently, Lieman (1966) is using Bellack's system to study the one-to-one relationship of teachers and pupils involved in homebound instruction.

The dimension of intellectual operations from Guilford's "structure of intellect" was used as the basis for the construction of the Gallagher-Aschner Classification System (Aschner, Gallagher, Perry, Afsar, Jenne, and Farr, 1965). As this classification system was employed in the present study, it is described fully in Appendix A. The five major categories of this system differ from Guilford's model in that cognition and memory were combined into one category and a category for routine classroom procedures was added. Each of the five general categories has secondary subcategories.

Gallagher (1965) used this classification system to study the verbal interactions of five superior social studies, science and English teachers and their intellectually gifted high school students. Gallagher obtained the following results:

1. The teacher's questions and her statements seemed to serve different purposes. Questions appeared to reflect the goals of the lesson and the curriculum, and the intellectual operations desired from the pupils; whereas, her statements seemed to represent her personal style of teaching.

2. It was found that one-half of the teacher's questions required answers in the cognitive-memory category; and it was concluded that this proportion is a necessary base

at this grade level. The next most frequent category of questions involved convergent thinking, while the divergent and evaluative thinking categories were called for least. Gallagher concluded that a good classroom could be run without divergent and evaluative thinking questions, but this could not be said for cognitive-memory and convergent thinking questions.

3. The teacher's questions depended on the subject matter and the nature of the class.

4. Sizable individual differences between teachers were reflected by the secondary categories.

   a. Ratios of the teacher's conclusion statements to her conclusion questions ranged from 3:1 to 10:1.

   b. Some teachers gave more positive than negative reinforcement while the converse was found for others. The nature of the group seemed to influence this variable.

   c. Raw scores in the fact dispensing category ranged from 9 to 169. The extreme scores seemed to reflect stress on information dispensing or abstract concepts.

5. Significant correlations were found between thought processes asked for by the teacher and the thought processes

supplied by the students. Hence, student performance closely followed the pattern required by teacher questions. The Taba et al. finding (1964) that the teacher can direct the students' level and flow of thought complexity by manipulating the questions asked supports Gallagher's finding. Gallagher concluded that the teacher has the crucial role of being the initiator and determiner of the thought processes expressed in the classroom, hence she may facilitate or inhibit the development of more effective productive thinking in her students. If the teacher's behavior is so important for the intellectual development of gifted children who can learn so much independently, then the importance of the teacher's behavior with mentally retarded children who cannot learn much independently must be inestimable.

Aschner (1963) used the Gallagher-Aschner Classification System to investigate the relationship between the variables of I.Q. and class size with student initiative which was operationally defined in terms of specific secondary categories. Gifted high school students exhibited significantly more initiative than average and mentally retarded high school students; however, the mentally retarded subjects produced more initiative units than the average students. Aschner attributed this to the informal, comfortable atmosphere created by the special class teacher.

Also using the Gallagher-Aschner Classification System, Cawley and Chase (1966) compared the verbal interactions of retarded children in special classes, retarded children in regular classes, and non-retarded children in regular classes. The results for the three types of classes were similar. Of the total units produced, one-half were classified as cognitive-memory, 80% as cognitive-memory and routine combined, and less than 5% as evaluative thinking and also as divergent thinking.

Research on Teaching Methods

In this section, research on teaching methods is considered primarily; although it probably is not possible to completely separate this from research on curricula. Teaching methods associated with specific subject matter areas such as reading, arithmetic, etc. are not presented, but rather teaching methods basic to all subject matters are considered.

Teaching methods and the educability of intelligence

Before discussing teaching methods, it is necessary to emphasize an underlying issue. The importance attributed to the role of the teacher, the teaching method, and the curriculum depends upon the position taken on the issue of the educability of intelligence.

Those who hold a pessimistic view of the educability of intelligence grant a limited role to the teacher, teaching method, and curriculum. Early special educators such as Scheidermann (1931), Ingram (1935), and Fernald (1943) believed that the mentally retarded were incapable of abstract thinking; and thus, advocated the teaching of rote responses to specific situations. Recently, Zigler (1966) has expressed pessimism about the effectiveness of education in changing the retarded child's level of intelligence. Blatt (1964) believes that the quality and kind of intervention (i.e., teaching method and curriculum) do not matter, but only the fact of intervention matters.

The optimistic position on the educability of intelligence, which presently seems to have many proponents (e.g., Hunt, 1961; McCandless, 1964; Gallagher, 1964, a; Bruner, 1961), is the basis for the importance attributed to the role of education.

Guilford (1959) has said that:

> The best position for educators to take is that every intellectual factor can be developed in the individual at least to some extent by learning (p. 478).

He concluded that if the development of certain intellectual abilities is the goal of education, then a teaching method and curriculum congruent with their development must be employed.

The importance of the teacher in educating intelligence has been stressed by Reynolds (1965) who contends that the capacities of children are determined by the quality of teaching they receive. Gallagher (1964, b) stated that:

> When a consistent teaching style or orientation is presented to the student over eight or nine months, it is easy to see how a teacher can modify the types of intellectual operations and products of the students (p. 192).

Some evidence for the educability of the retarded child's intelligence within a classroom setting has been reported. Katz (1963) designed a course of study to develop problem solving ability for retarded high school students. He found that students given this instruction were better able to cope with new problems than students given a rote learning course of study. Rouse (1965) reported that retarded children given classroom instruction in brainstorming performed better on tests of divergent thinking than retarded children not exposed to such instruction. Tisdall (1962) found that on verbal tests of divergent thinking mentally retarded children in special classes were superior to such children in regular classes. He attributed this to be curriculum and teaching method provided in the special class.

The inductive teaching method

More than any other method, the inductive teaching method has been advocated as a means for educating intellectual abilities. Bruner (1964), the foremost advocate of this method, defined the inductive or "discovery" method as an approach which permits the student to discover for himself the generalizations that lie behind the facts. In this way the structure or general principles of a subject matter can be taught. Wallach and Kogan (1965) and Getzels and Jackson (1962) have recommended this teaching method for training creativity.

Sparks and Blackman (1965) argue that an effective teaching method is appropriate for all children, and that there is no method specific to one group of children. Thus, the inductive method, which has been used extensively with gifted children, has been advocated for use with the mentally retarded (Goldstein, 1963).

Prior to Goldstein's work with this method, there was no direct attention given to general teaching methods for the mentally retarded. Dawe (1959) reviewed the literature on teaching methods for the retarded from 1948 to 1958. She found only eight articles, three of which discussed particular techniques such as the use of audio-visual aids, play acting, etc., and the other "five were general enough in nature to make their larger contributions to the field of educational psychology rather than specific techniques of teaching" (p.21).

Goldstein, Moss, and Jordan (1965) found that lower I.Q. retarded children in special classes who were exposed to an experimental curriculum and an inductive teaching method were superior to such retarded children in regular classes in the areas of academic achievement, basic information, certain personality characteristics, and on verbal measures of divergent thinking. However, the higher I.Q. retarded children in regular classes were found to be academically superior to such retarded children in special classes. The teachers used in their study were probably not representative of special class teachers because the former were specially trained and were selected on the basis of being excellent teachers. Consequently, Goldstein (1963) is currently conducting an investigation to determine whether "typical" special class teachers with varied preparations and experiences can be re-trained to use the experimental curriculum and inductive method in their classrooms, and to determine whether behavior changes can be attained with their mentally retarded pupils. Goldstein's inductive teaching method is described in detail because it was the teaching method employed in the comparative aspect of this study.

Goldstein's description of the inductive teaching method

To Goldstein, the primary goal for the education of the mentally retarded child is to prepare him "to think critically and independently to the best of his ability" (p. 1). He contends that his experimental curriculum is related to critical thinking in that it provides the retarded child with the basic data (i.e., facts, concepts, skills, etc.) employable in evaluating his environment. His inductive teaching method is related to independent thinking in that it encourages the retarded pupil to use the basic data provided by the curriculum to make decisions independent of external guidance.

Goldstein contrasts his inductive or experimental teaching method (the E method) with other methods that might be used in special classes (the control or C methods) as follows.

1. The nature of the learning situation as reflectd in teacher questions. The E teacher seeks to develop the

retarded child's ability to think independently by placing pre-eminence on the development of problem solving ability. This method calls for the child's use of inductive reasoning to arrive at a solution to a problem (hence, the label "inductive method"). Therefore, the E teacher poses a problem situation and asks questions requiring the student to use reasoning to arrive at a solution to the problem.

The C teacher is concerned with fact dispensing and rote learning. Thus, her questions require the use of memory or simple cognition. This serves to encourage the retarded child's dependence on others to solve his problems.

2. Selection of cues to structure the learning situation and to elicit pupil responses. The E teacher's goal is to structure the learning situation so that the pupil can see the cues relevant to solving the problem, make the appropriate association of the present cues with already learned facts, and then either develops a hypothesis that will enhance the probability of arriving at an appropriate solution to the problem or goes directly to the solution. The E teacher's selection of cues is based on her diagnosis of the child's fund of knowledge in each ability area. Thus, the cues provided are relevant to the problem and appropriate to the child's developmental level.

The C teacher does not create problem solving situations, and thus _may_ not be concerned with the selection of relevant cues. If she does attend to the cues provided, it is probable she does not select them in relation to the child's developmental level. Thus, the cues provided by the C teacher may be neither relevant nor appropriate.

3. _The nature of teacher feedback to student performance._ With the E method the child's correct responses are immediately reinforced. After the child has incorrectly responded, the teacher gives negative reinforcement and/or signals the child to evaluate his response and then re-respond. The E teacher does not prompt the child nor does she supply the correct answer. If the child persists in giving the incorrect response, the E teacher evaluates the situation to determine whether the appropriate response has been built into the child's response repertoire in sufficient strength to be elicited or whether the cues are appropriate. Then the E teacher re-structures the learning situation accordingly. Hence, the teacher is teaching and testing simultaneously.

By using this approach, the E teacher is building into the retarded child mediating behavior which encompasses the following learnings. (a) The child learns to assess the results of his action by observing its impact on others.

(b) He learns that it is appropriate to re-read the cues provided by the teacher as they relate to his response.

(c) He acquires a feeling of independence from the realization that through his own efforts he can solve a problem.

After a student's correct response, the C teacher provides positive reinforcement; therefore, the E and C teachers do not differ with respect to their feedback to correct student performance. However, one of the most critical differences between the E and C teachers is their feedback to incorrect student responses. The C teacher does not ask the child to evaluate his wrong response nor does she ask him to re-respond. Often she provides the correct response. Thus, the teacher acts as the sole judge of right and wrong, and builds the dependence of the retarded child.

4. Consistency of teaching methods. The E method is used consistently from one subject matter to another. Because it underlies as many teacher-pupil interactions as possible, it pervades the non-academic as well as academic areas of instruction. The C methods are usually eclectic and sketchy. They are generally related to objects, teaching aids, guides accompanying texts, etc. Thus, there is much variation from one subject matter to another; and this

variation is most marked between the academic and non-academic subjects.

In Fig. 2 the methods are contrasted diagrammatically so as to highlight their differences. The methods differ in: (1) the types of questions asked by the teachers; (2) the types of cues provided by the teachers; (3) the processes used by the students to answer the teachers' questions; (4) the teachers' feedback to incorrect student performance; and (5) the amount of responses made by the students.

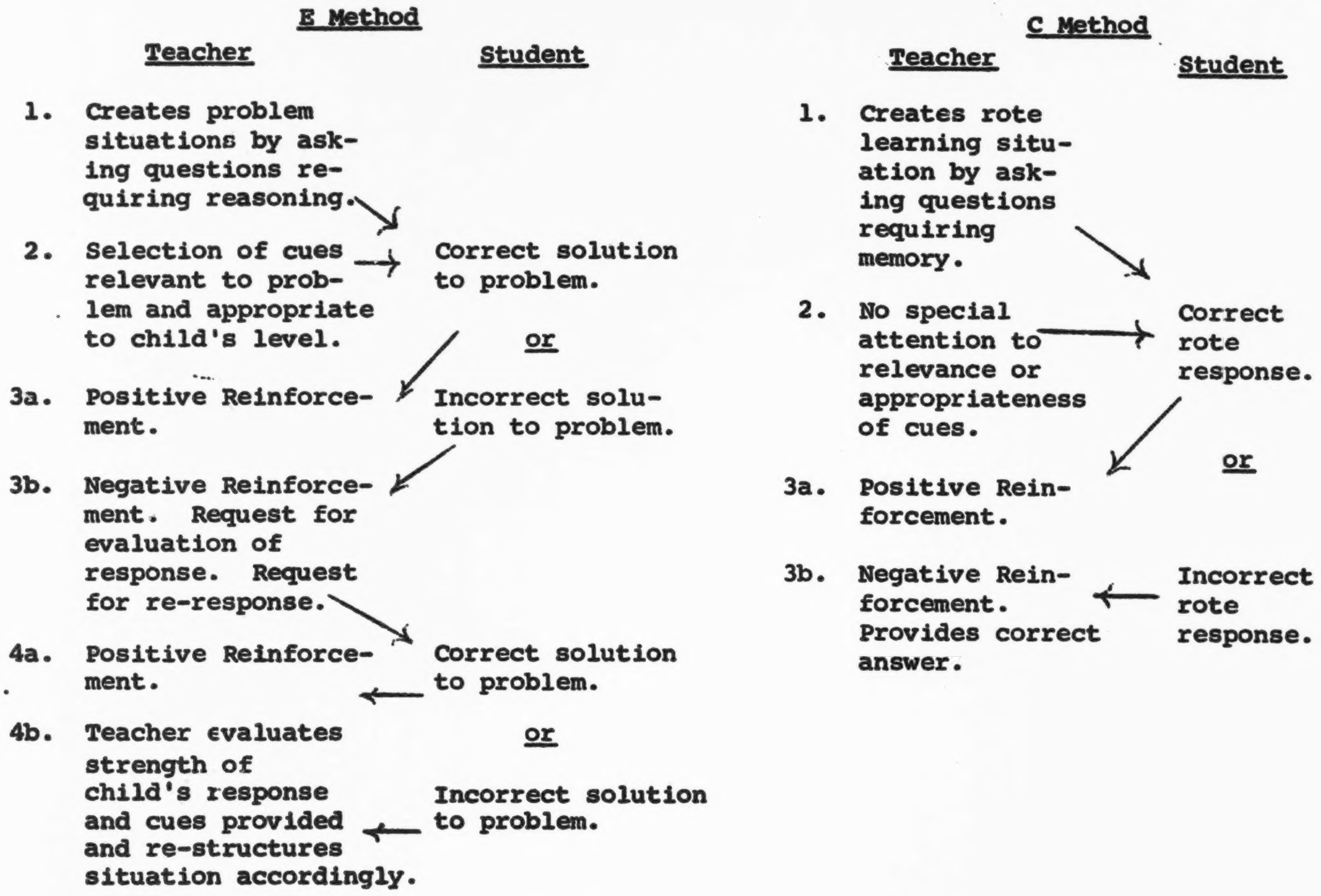
If another dimension could be added to Fig. 2, it would show that the E method is used consistently in all subject matter areas, while this is not true for the C methods.

From this comparison of the E and C methods, Goldstein's contention that the inductive method develops independent thinking while the other methods do not seems well-founded.

Wallen and Travers (1963) state that "an unreasonable assumption is made that, because a teaching method has been described corresponding patterns of behavior can be, or are, manifested by teachers" (p. 467). Medley and Mitzel (1963) propose that teaching methods can only be differentiated by direct observation in the classroom. Hence, an objective of this study was to make explicit the actual teaching behaviors

Figure 2

Comparison of the E and C Teaching Methods



E Method

	Teacher	Student
1.	Creates problem situations by asking questions requiring reasoning.	
2.	Selection of cues relevant to problem and appropriate to child's level.	Correct solution to problem.
		or
3a.	Positive Reinforcement.	Incorrect solution to problem.
3b.	Negative Reinforcement. Request for evaluation of response. Request for re-response.	
4a.	Positive Reinforcement.	Correct solution to problem.
		or
4b.	Teacher evaluates strength of child's response and cues provided and re-structures situation accordingly.	Incorrect solution to problem.

C Method

	Teacher	Student
1.	Creates rote learning situation by asking questions requiring memory.	
2.	No special attention to relevance or appropriateness of cues.	Correct rote response.
		or
3a.	Positive Reinforcement.	
3b.	Negative Reinforcement. Provides correct answer.	Incorrect rote response.

of the teachers supposedly using the E method and those using the C methods, and to determine whether these were congruent with Goldstein's descriptions of these methods.

Teacher and Pupil Background Characteristics

Although it has been generally recognized that the background characteristics of the teacher and the pupil influence the classroom interaction (Klausmeier, 1961; Ryans, 1963; Quay, 1963), little research has been directed toward studying the effects of these characteristics.

The teacher characteristics of age, teacher preparation, and professional experience were investigated in this study. In the only study on the variable of teacher age, Ryans (1960) found that elementary school teachers over the age of 55 were inferior to younger teachers in the social climates they created in the classroom. None of the three teacher characteristics of this study have been investigated with teachers of the mentally retarded.

The pupil characteristics of I.Q., M.A., and C.A. were selected for attention in this study. Class size, which was classed as a pupil variable, was also analyzed.

Taba et al. (1964) found that the pupil characteristic, I.Q., was not correlated with the level of thought expressed by the students in the classroom discussion. Because of the previously stated criticisms of this study, the writer views this finding with reservation.

The variable of linguistic ability (which was considered synonymous with measured I.Q. here) and the level of verbal interaction has been studied in laboratory situations. Spradlin and Rosenberg (Spradlin, 1963) hypothesized that college students would emit different percentages of binary questions (questions that can be answered by one of two responses such as "Are you a girl?") and multiple questions (questions that allow multiple possibilities for an answer such as "Who discovered America?") according to whether the mentally retarded child being interviewed was high or low in linguistic ability. This hypothesis was not confirmed, which may have been due to the artificial situation created for the purpose of the study and to the inability of the "naive" adults to evaluate the child's linguistic level. Spradlin and Rosenberg's hypothesis was investigated with the children of high and low I.Q.'s of the present study because the classroom seemed to be a more natural setting for verbal interaction and because special class teachers seemed more "sophisticated" at determining the child's level of verbal interaction.

Hypotheses

The following hypotheses within each of the three problem areas previously identified were proposed on the basis of related research.

Description of the teacher-pupil verbal interaction

Because of the paucity of related research, the emphasis in this problem area was on a descriptive presentation of the findings. However, three hypotheses based on Gallagher's findings (1965) were proposed.

It seemed that the distribution pattern of teacher questions in the four primary categories identified by Gallagher might be found in all types of classrooms; therefore, it was hypothesized that:

> Hypothesis I: The distribution of the teachers' questions in order of greatest frequency will be: cognitive-memory, convergent thinking, and then equal amounts of divergent and evaluative thinking.

Gallagher found that 50% of all teacher questions fell into the cognitive-memory class, while Hughes (1959) found an even greater percentage. Because Gallagher worked with gifted high school students and Hughes with normal elementary school children, it seemed that an even greater percentage of simple memory questions would be asked of mentally retarded elementary school children. Hence, it was hypothesized that:

> Hypothesis II: The average amount of cognitive-memory questions asked by the teachers will be significantly greater than 50% of all questions asked.

The crucial role of the teacher in influencing productive thinking was supported by the significant correlations Gallagher (1965) and Taba et al. (1964) obtained for the type of intellectual operation requested by the teacher and that supplied by the student. It seemed that such discourse agreement would exist between the special class teacher and her mentally retarded pupils; thus, it was hypothesized that:

> Hypothesis III: There will be a significant positive correlation between the thought processes requested by the teachers and what is supplied by their mentally retarded pupils.

Comparison of E and C teachers

The hypotheses in this area were designed to determine whether teachers purportedly using Goldstein's E and C methods were actually doing so.

Inasmuch as the teaching method employed seems to be reflected in the teacher's questions, there should be differences between Goldstein's E and C teachers' questions *if* they were really using the inductive teaching method. The E method was designed to develop problem solving through the use of inductive reasoning; therefore, differences in the amount of convergent thinking questions between the E and C teachers should be found. Tisdall (1962) found that mentally retarded students of teachers supposedly using the inductive teaching method were superior in divergent thinking to retarded children who were presumably not receiving this method; thus, it would seem that the E teachers would ask more divergent thinking questions. It was hypothesized that:

> Hypothesis IV: The E teachers will ask significantly more questions involving productive thinking than the C teachers.

If the E teachers were using the inductive method, they should have encouraged their pupils to reach conclusions on their own rather than providing conclusions for them. Since Gallagher found that his teachers gave many more conclusion statements than conclusion questions, this should be true for the C teachers too. Thus, there should be differences between the E and C teachers in the conclusion subcategory of the convergent thinking class. It was hypothesized that:

> Hypothesis V: The E teachers will ask significantly more conclusion questions than the C teachers; while the C teachers will give significantly more conclusion statements than the E teachers.

Goldstein described the C teachers as stressing fact dispensing, while the E teachers were discouraged from concentrating solely on this. Thus, differences between the E and C teachers should be observed in the factual subcategory of the cognitive-memory class. It was hypothesized that:

> Hypothesis VI: The C teachers will utter significantly more questions and statements in the factual sub-category than the E teachers.

One of the most critical aspects of Goldstein's inductive method involves the teacher's behavior after the student has responded incorrectly. According to Goldstein, the E teachers do not provide the right answers after a student's incorrect response, while the C teachers may do so. It was hypothesized that:

> Hypothesis VII: The C teachers will provide significantly more correcting responses after the students' incorrect responses than the E teachers.

Furthermore, Goldstein has proposed that the E teacher asks the child to evaluate his response after he has incorrectly responded. Thus, it was hypothesized that:

> Hypothesis VIII: The E teachers will ask for significantly more evaluations after the pupil has incorrectly responded than the C teachers.

If Goldstein's contention that the E method is used consistently in practically all teacher-pupil interactions is accurate, then there should be few, if any, differences in the E teachers' questions with changes in subject matter. Therefore, it was hypothesized that:

> Hypothesis IX: There will be greater consistency for the E teachers' questions during the course of the school day irrespective of subject matter area than for the C teachers.

If teacher statements reflect personal teaching style as Gallagher has stated, then the influence of any particular teaching method should be negligible. Therefore, it was hypothesized that:

> Hypothesis X: There will be no significant differences between the E and C teachers' statements in the primary categories.

Investigation of teacher and pupil background characteristics

Only one hypothesis was proposed for the effects of pupil characteristics on the classroom interaction. This was based on Spradlin and Rosenberg's (Spradlin, 1963) hypothesis that adults would ask more binary questions of children of low linguistic ability.

> Hypothesis XI: There will be a significant negative correlation between the amount of binary questions asked by the teacher and the mean I.Q. of her class.

No specific hypotheses were proposed for the other pupil characteristics or for the teacher characteristics. A general description of the results was employed because of the lack of related background literature.

CHAPTER III

METHOD

Sample

Two samples of Ss were used, one of teachers and one of students. Twenty teachers of primary and intermediate level special classes for the mentally retarded in New Jersey were asked to serve as Ss. Ten teachers were randomly selected from Goldstein's E group of 30, while his total C group of 10 teachers was used. Three teachers refused to participate; one C teacher for administrative reasons while another C teacher and an E teacher refused for personal reasons. Thus, 17 teachers were used, nine in the E group and eight in the C group.

In the academic year preceding this study, the E and C teachers were given the following experimental treatment by Goldstein.

1. The E teachers were given 32 training sessions on the experimental curriculum and the inductive teaching method, while the C teachers were given no training. The training was conducted by the lecture and discussion method.

2. Once a month a supervisor consulted with each E teacher to assist her in the use of the experimental curriculum and method. No supervision was given the C group.

A description of the characteristics of the E and C teachers, as well as the total group, is presented in Tables 1 and 2. In terms of the total sample, the average teacher was a 39-year-old white female with a B.S. degree in an area other than special education who had taught about eight years, half of which time had been spent with the mentally retarded.

TABLE 1

TEACHER SAMPLE CHARACTERISTICS ON SEX, RACE, AND PROFESSIONAL PREPARATION

	E Group	C Group	Total
Sex			
Female	9	8	17
Male	0	0	0
Race			
White	8	7	15
Negro	1	1	2
Highest Degree Earned			
B.S.	7	7	14
M.S.	2	0	2
Ph.D.	0	1	1
Major Area of Study			
Special Education	2	2	4
Education	3	3	6
Other	4	3	7

TABLE 2

TEACHER SAMPLE CHARACTERISTICS ON AGE AND TEACHING EXPERIENCE

		Age		Years of Teaching		Years of Teaching Mentally Retarded	
	N	$\bar{X}$	S.D.	$\bar{X}$	S.D.	$\bar{X}$	S.D.
E Group	9	37.50	13.30	7.67	6.89	4.22	2.62
C Group	8	39.87	12.81	8.00	4.37	2.87	2.64
Total	17	38.78	12.72	7.84	5.67	3.54	2.64

The distributions for the teachers' total years of teaching experience and their years of teaching with the mentally retarded were relatively continuous; but this was not true for age. The mean ages presented in Table 2 conceal the dichotomous distributions for the total group as well as for the E and C groups. Half the teachers in each of these groups were young (i.e., from 23 to 34) and half were relatively old (i.e., from 42 to 59). No S̲ was in the middle age bracket from 34 to 42. Because of the non-continuous distribution for this variable, two statistically significant age groups ($\underline{t} = 2.19$; df = 15; $\underline{p} < .05$) were formed for the analysis of the effects of teacher age. Table 3 presents a description of the younger (Y) and the older (O) groups.

In terms of the E and C groups, no significant differences were found on any of the background variables de-

TABLE 3

AGE GROUPINGS FOR TEACHER SAMPLE

	N from E Group	N from C Group	Total N	Age	
				$\overline{X}$	S.D.
Y Group	4	4	8	26.75	3.99
O Group	5	4	9	49.22	6.83

scribed in Tables 1 and 2. As can be noted from these tables, the two groups were very similar on all the variables.

The 167 mentally retarded pupils enrolled in the special classes of the 17 teachers comprised the student sample. Characteristics of the student sample are presented in Tables 4 and 5. The M.A.'s and I.Q.'s (based on WISC's and Stanford Binets) reported in Table 5 were taken from the school files because an individual intelligence test administered by a qualified psychological examiner is a legal requirement for special class placement of the mentally retarded in New Jersey. Race was the only variable on which the E and C students differed significantly ($\underline{X}^2 = 12.10$; df = 2; $\underline{p} < .01$). This was due to the fact that one experimental class was composed solely of Jackson Whites, a genetically isolated group of White, Negro, and American Indian background.

TABLE 4

STUDENT SAMPLE CHARACTERISTICS ON CLASS SIZE, SEX, AND RACE

	N	Students per class	Sex (per cent)		Race (per cent)		
		$\bar{X}$	Boys	Girls	White	Negro	Jackson White[a]
E Group	92	10.22	55	45	65	23	12
C Group	75	9.37	61	39	84	15	1
Total	167	9.82	58	42	74	19	7

[a] A genetically isolated group of White, Negro, and American Indian background.

TABLE 5

STUDENT SAMPLE CHARACTERISTICS ON C.A., M.A., AND I.Q.

	N	C.A.		M.A.		I.Q.	
		$\bar{X}$	S.D.	$\bar{X}$	S.D.	$\bar{X}$	S.D.
E Group	9	10-1	1-3	7-1	1-1	69.56	5.05
C Group	8	10-2	1-0	6-11	0-9	67.87	3.79
Total	17	10-2	1-1	7-0	0-11	68.76	4.45

Apparatus

The Walkie-Recordall tape recorder, weighing only five pounds and having only one microphone, was used to tape record the classroom interactions. In a pilot study comparing this recorder with a Wollensak, which is usually used in such studies, the former was found superior because of its ease in being carried around the classroom and its minimization of background noise.

Procedure

The E and C classes were tape-recorded in a random order in the second year of Goldstein's study. Since training was given the E teachers in the first year of that study, it was anticipated that they should be using the inductive method by the beginning of the second year.

Letters were sent to the E and C teachers requesting them to choose from several alternatives the most convenient date to tape record their classes. The teachers were not informed of the purposes of this study. Rather, they were told that the tape recorder was being evaluated for future use and that the tapes were to be used to train research assistants in the Goldstein study. This precaution was thought necessary to minimize the teachers' drastically altering their teaching methods and verbal behavior. It is probable that they changed their behavior somewhat with an observer and a tape recorder in the room, but there is no way of completely eliminating this at the present time. Since the E and C teachers were given the same explanations, they should have changed their behavior to a similar degree, if they changed at all, so that comparisons between them were still valid.

Each class was taped for one full day. All subject matter areas taught by the teacher except music and physical education were recorded. The writer made observational notes on emotional tone and pertinent non-verbal behavior such as blackboard material, demonstrations, etc.

The tape recordings and observational notes were integrated and transcribed by the writer immediately after the tape recording was made. The writer took on the task of transcription rather than assigning it to a secretary because it was believed that only a person who had been present in the classroom could do this accurately. Thus, the functions of memory and closure enabled the writer to fill the gaps involved in transcription.

A secretary then typed the transcription which was called the tapescript. She assigned each E and C teacher a code letter so that the judges could not determine whether an E or C teacher's performance was being rated.

Two judges, the writer and a graduate student majoring in educational psychology, used the Gallagher-Aschner Classification System described in Appendix A to code the tapescripts. In Appendix B the additional codings used for the specific purposes of this study are presented. Samples of teacher-pupil verbal interactions demonstrating aspects of the inductive method and productive thinking are provided in Appendix C.

The writer gave 36 hours of training in the use of the classification system to the graduate assistant. Six practice tapescripts were used for this purpose.

Each judge independently classified each of the 17 tapescripts. First, each judge separated the units to be classified by slashes on the tapescripts. Then each unit was numbered. The abbreviation for the Gallagher-Aschner secondary category was recorded on a record sheet at the appropriate unit number and under the T column if this was a teacher's utterance and under the S column if it was a student's. Notations of primary classes were omitted because each of the abbreviations for the secondary categories differed. Questions were indicated on the record sheet by underlying the classification. An example of a unitized tapescript is presented in Fig. 3, and a sample of a completed record sheet can be found in Fig. 4.

After all 17 tapescripts had been coded, the two judges compared their analyses. In cases of disagreement the judges attempted to resolve the dispute by presenting the rationales for their decisions. If an agreement could not be reached between the two judges, a third judge was consulted.

The E and C tapescripts were coded in a random order; however, the order of coding for the judges was the same. To determine the intra-judge reliability for each of the judges, 100 randomly selected units from the first tapescript coded and another 100 from the second were re-coded after the eighth and again after the seventeenth tapescripts. Also, 100 units from the ninth tapescript were re-coded after the seventeenth. To obtain a measure of the consistency of coding over the 17 tapescrips for each judge, the re-codings were compared with the original codings. The per cent of agreement for these comparisons for each of the judges is presented in Table 6. It should be noted that both judges' codings were consistent over time. Thus, it seemed that their original training was sufficient, and little learning took place while the tapescripts were being analyzed.

Figure 2

Sample Unitized Tapescript

Language arts lesson. Teacher is having group of three children describe pictures in a reading readiness book.

T: 666 /Now who's this?/ (T points to picture of Jane).

S: 667 /Dick's sister./

T: 668 /Dick's sister./ 669 What's her name?/

S: 670 /Jane./

T: 671 /Jane./ 672 And the little sister is___?/ (T points to Sally).

S: 673 /Sally./

T: 674 /Sally./ 675 What are they doing?/

S: 676 /Picking apples./

T: 677 /They're picking apples./ 678 And where are they putting them?/

S: 679 /(No response)/

T: 680 /Into a what?/

S: 681 /Basket./

T: 682 /A basket./ 683 Look at Grandfather's basket here. Which one is bigger?/

S: 684 /Grandfather's./

T: 685 /Right./ 686 Grandfather's is bigger./ 687 What color are the apples

S: 688 /Red./

T: 689 /And what do we do with red apples?/

Jim: 690 /We eat them./

T: 691 /We eat them./ 692 That's very good. You knew everything in here. You all make 100's./ 693 Now let's go to the second box./ 694 James has it. Good. Right./ 695 Put your finger on the second box./ 696 That's right./ 697 Now what's Grandfather doing there?/

Figure 4

Sample Record Sheet

Teacher 0

Coder EH

	T	S		T	S		T	S		T	S
601	sto		626	fs		651	Rep		676		fs$^+$
602	MW		627		fs$^+$	652	ver$^+$		677	Rep	
603	ver$^+$		628	Rep		653	fs		678	fs	
604	fs		629	ver$^+$		654		fs$^+$	679		du
605		fs$^+$	630	fs		655	fs		680	sto	
606	Rep		631		du	656		fs$^+$	681		fs$^+$
607		Rep	632	sto		657	fs		682	Rep	
608	Rep		633		fs$^+$	658		fs$^+$	683	fs	
609	ver$^+$		634	Rep		659	fs		684		fs$^+$
610	fs		635	ver$^+$		660		fs$^+$	685	ver$^+$	
611		fs$^+$	636	exr		661	Rep		686	Rep	
612	exr		637		du	662	conl		687	fs	
613		du	638	sto		663		conl$^+$	688		fs$^+$
614	sto		639		du	664	Rep		689	fs	
615		du	640	sto		665	ver$^+$		690		fs$^+$
616	fs		641		du	666	fs		691	Rep	
617		fs$^+$	642	sto		667		fs$^+$	692	verp$^+$	
618	Rep		643		fs$^+$	668	Rep		693	stc	
619	fs		644	Rep		669	fs		694	ver$^+$	
620		du	645	sto		670		fs$^+$	695	stc	
621	fs	(RR)	646		exr$^+$	671	Rep		696	ver$^+$	
622	fs		647	Rep		672	fs		697	fs	
623		fs$^+$	648	ver$^+$		673		fs$^+$	698		X
624	Rep		649	fs		674	Rep		699	sto	
625	fs		650		fs$^+$	675	fs		700		fs$^+$

TABLE 6

PER CENT OF AGREEMENT FOR RE-CODED AND ORIGINAL ANALYSES OF TAPESCRIPTS FOR BOTH JUDGES

	Judge A		Judge B	
Original Tapescript Coded	Time of Re-coding		Time of Re-coding	
	After 9th	After 17th	After 9th	After 17th
1st	95	95	97	98
2nd	100	100	94	100
5th	-	98	-	97

The two judges' codings for units 500 to 600 for each of the 17 tapescripts were compared to obtain a measure of inter-judge agreement. These units were randomly selected after all the tapescripts had been coded by both judges so that no special attention could be given to these units. After the codings for these 1700 were compared, it was found that there were only seven units classified in the convergent thinking category, 14 in divergent thinking, and 15 in evaluative thinking. Because of these small amounts, all units coded in the three productive thinking categories for all 17 tapescripts were used for inter-judge agreement, rather than just those from units 500 to 600.

The following formula for a coefficient of agreement as reported by Smith and Meux (1963) was used.

$$R_i = \frac{A_i}{A_i + D_{1i} + D_{2i}}$$

R_i = Coefficient of agreement for category i.

A_i = Number of agreements in category i.

D_{1i} = Number of entries placed in category i by the first judge, but not the second.

D_{2i} = Number of entries placed in category i by the second judge, but not the first.

In Table 7 the coefficients of agreement for each of the five major categories as well as the total number of units analyzed are presented. The coefficients of agreement for the productive thinking categories were lower than those for the routine and cognitive-memory classes. This difference is attributed to the relatively infrequent appearances of the productive thinking categories which may have resulted in the judges being less familiar with these categories and in their not "expecting" them (i.e., their having a set not to code statements in these categories). The lowest amount of agreement was found in the divergent thinking class. This may have been due to the series of divergent thinking utterances which usually occurred together. When the teacher asked a divergent thinking question, it was generally followed by a train of many divergent thinking responses from the students. However, a cognitive-memory, convergent thinking, or evaluative thinking question usually elicited only one or two such responses from the students. Therefore, the initial decision as to the classification of the first divergent thinking response influenced the subsequent classifications of such responses; whereas, this was not true of the other classes.

TABLE 7

COEFFICIENTS OF AGREEMENT FOR TWO JUDGES ON
THE MAJOR GALLAGHER-ASCHNER CATEGORIES

Categories	R
Routine	.89
Cognitive-memory	.89
Convergent thinking	.68
Divergent thinking	.65
Evaluative thinking	.72
Total units	.80

The coefficient of agreement of .80 obtained for the total units compared is similar to Gallagher's finding of 78% agreement for two teams of judges using the Gallagher-Aschner Classification System. These results seem to indicate that this classification system was used consistently by the two judges.

CHAPTER IV

RESULTS

Wherever possible, non-parametric statistics were used in testing the hypotheses because of the inability to validly make the assumptions about levels of measurement, distributions of populations, and variances which are required for the use of parametric statistics (Siegel, 1956). In addition to the usual procedure of reporting measures of central tendency and dispersion, ranges of certain selected variables are presented. The writer believes attention to the extremes necessary for a comprehensive analysis of "good" and "poor" teacher and student performance.

The level of significance used in this study was .05. However in some cases the .10 level of significance was reported as an indication of a possible trend.

Description of the Teacher-Pupil Verbal Interaction

Analysis of background data

The average class was in school for 310 minutes or six hours, but only 157 minutes or half of the total time in school was recorded. The disparity between the time in school and the time recorded can be explained by analyzing how the time in school was spent. Forty-one per cent of the total time in school was devoted to academic subjects, 30% to non-academic subjects, and 29% to other areas such as lunch, clean up, rest, and periods of no activity. All subject matters taught by the special class teacher were recorded. The academic subjects were always taught by the special class teacher; therefore, the 41% of the total time devoted to these areas was recorded. The non-academic areas of art, music, and physical education were frequently taught by itinerant teachers, and thus could not be recorded. It was also found that the noise levels in art and physical education classes caused insurmountable transcription problems. Hence, about 10% of the 30% spent on non-academic subjects was recorded. None of the 29% devoted to other areas was taped.

A more detailed description of the times allotted to different activities is presented in Table 8. The greatest amount of time was spent on laguage arts, and then on lunch. These two areas combined accounted for almost 50% of the school day. The number of classes in which time was devoted to each area is also given in Table 8. Language arts, opening exercises, and lunch were the only areas found in all 17 classes. Science was taught in only three classes.

The total number of units analyzed for the 17 classes was 27,222. The mean number of units per class was 1601. Because the number of units per class ranged from 881 to 2,524, the units in each category were converted to percentages so that comparisons between teachers could be made.

The teachers produced 65% of the total units, 15% of which were questions and 50% of which were statements, while the students produced 35% of the total units. No distinction between questions and statements was made for student utterances because Gallagher (1965) found that student questions were usually hesitantly ventured answers.

TABLE 8

PER CENT OF TOTAL TIME IN SCHOOL SPENT
ON DIFFERENT SUBJECT MATTER AREAS

Subject matter	Per Cent of time	N[a]
Language arts	25.94	17
Arithmetic	8.47	14
Social studies	5.29	11
Science	1.65	3
Music	5.53	9
Opening exercises	5.06	17
Art	6.76	10
Physical education & games	12.41	15
Lunch	22.47	17
Other[b]	5.74	8

[a] Number of classes out of the 17 in which time was devoted to these areas.

[b] Clean up, rest and periods of no activity.

Analysis of teacher questions

The analysis of teacher questions was conducted for the four categories of intellectual operations. Questions in the routine category were not considered relevant to the analysis of thought processes desired by the teacher. Gallagher (1965) excluded the routine category from his analysis of teacher questions because he found that utterances in this category were usually statements rather than questions.

It should be noted from Table 9 that 88% of the teachers' questions were classified as cognitive-memory, 4% as convergent thinking, 3% as divergent thinking, and 5% as evaluative thinking. In hypothesis I it was predicted that the order of greatest frequency for teacher questions would be cognitive-memory, convergent thinking, and then equal amounts of divergent and evaluative thinking. As predicted, the cognitive-memory class was largest; however, evaluative thinking rather than convergent thinking was second. To determine the statistical differences between each of the four categories, Mann Whitney "U" tests were conducted. These results are presented in Table 10. The smaller the value of the "U" obtained, the greater the probability of a significant difference. The amount of cognitive-memory

TABLE 9

PER CENT OF TEACHER QUESTIONS IN FOUR MAJOR CATEGORIES

Category	Mean Per Cent	Range
Cognitive-memory	88	71-97
Convergent thinking	4	0[a]-24
Divergent thinking	3	0[a]-9
Evaluative thinking	5	1-17

[a] Less than 1%.

questions was significantly greater than each of the other three categories. A "U" of 0 was obtained for each comparison of the cognitive-memory category; thus, in no case did a teacher ask more productive thinking questions than cognitive-memory questions. Significantly more evaluative thinking questions were asked than divergent thinking questions. The difference between the evaluative thinking and convergent thinking questions approached significance. No difference was found between convergent and divergent thinking questions. On the basis of these results, the order of teacher questions was cognitive-memory, evaluative thinking, and then equal amounts of convergent and divergent thinking.

TABLE 10

VALUES OF MANN WHITNEY "U's" FOR COMPARISONS BETWEEN PER CENT OF TEACHER QUESTIONS IN FOUR CATEGORIES ($N_1 = 17$, $N_2 = 17$)

	Convergent thinking (4%)	Divergent thinking (3%)	Evaluative thinking (5%)
Cognitive-memory (88%)	0[a]	0[a]	0[a]
Convergent thinking (4%)	-	129.5	94[c]
Divergent thinking (3%)	-	-	77[b]

[a] Significant at .001 level.
[b] Significant at .05 level.
[c] Significant at .10 level.

As can be noted from Table 9 the differences in the mean per cents of questions in the three productive thinking categories were practically negligible (i.e., one and two per cent). These slight differences were found significant with "U" tests because this statistic considers the rank order rather than the magnitude of differences. Since the rank order of the three productive thinking categories was consistent for most of the teachers, significant differences were obtained with "U" tests. When "t" tests (which consider the magnitude of differences) were used for the differences between each of the three productive thinking categories, none of them were found significant. These results support the logical conclusion that one and two per cent differences cannot be meaningfully interpreted as significant.

Therefore, hypothesis I was supported for cognitive-memory, but not for the three productive thinking categories. The order of greatest frequency for the teachers' questions was cognitive-memory, and then equal amounts of convergent, divergent, and evaluative thinking.

Although there was little variation in the mean per cents of teacher questions for the three productive thinking categories, more variability was found for the ranges which are shown in Table 9. An analysis of the ranges for the cognitive memory category shows that the teacher at the lower extreme (i.e., the one with 71% cognitive-memory questions) encouraged a considerable amount of productive thinking. The teacher at the upper extreme (i.e., the one with 97% cognitive-memory questions) discouraged any productive thinking.

Large ranges of convergent thinking questions (i.e., 0% to 24%) and evaluative thinking questions (i.e., 1% to 16%) were found. However, the evaluative thinking questions of these teachers should be viewed circumspectly. Two-thirds of the evaluative thinking questions were of a binary nature such as "Do you like apples?" In fact, most of the questions in this category were of the "do you like" type. Such questions do not necessarily seem to require any higher level mental processes; and thus, they do not seem to fit under the productive thinking rubric.

The range of divergent thinking questions was constricted (i.e., 0% to 9%). Hence, none of these teachers stressed divergent thinking as much as convergent and evaluative thinking.

In summary, from an analysis of the ranges it cannot be concluded that all of these teachers ignored productive thinking questions as might be concluded from an analysis of the means. Some teachers did encourage productive thinking, especially convergent and evaluative thinking. However, none of them stressed divergent thinking.

In hypothesis II it was predicted that the average amount of cognitive-memory questions asked by the teachers would be significantly greater than 50% of all questions asked. The 88% found was significantly greater than the 50% predicted (t = 19.65; df = 16; $p < .001$); therefore, hypothesis II was confirmed. It should be noted from the ranges in Table 9 that the least per cent of cognitive-memory questions was 71% which far exceeds 50%. Therefore, this finding was true for all teachers.

Analysis of teacher statements

All five major categories were used for the description of teacher statements which is presented in Table 11. Almost two thirds of the teachers' statements were classified in the routine category; while only 2% were in the three productive thinking categories combined. From this distribution it seems that the teachers used their statements primarily to manage the classroom routine, and secondarily to present factual information. The ranges also presented in Table 11 support these conclusions. The minimal amount of productive thinking statements is striking.

TABLE 11

PER CENT OF TEACHER STATEMENTS IN
FIVE MAJOR CATEGORIES

Category	Mean Per Cent	Range
Routine	63.00	41-75
Cognitive-memory	28.88	17-48
Convergent thinking	.41	0[a]- 2
Divergent thinking	.59	0[a]- 2
Evaluative thinking	1.35	0[a]- 4
X[b]	5.77	0[a]-17

[a] Less than 1%.

[b] Uncodable statements.

Analysis of student utterances

The distribution of student utterances in the five major categories is shown in Table 12. More than half of the student remarks were classed in the cognitive-memory class while only 6% was found for the three productive thinking categories combined. The distribution of student remarks resembles that of teacher questions more than teacher statements. The students' role seems to be primarily that of giving factual information.

TABLE 12

PER CENT OF STUDENT UTTERANCES IN
FIVE MAJOR CATEGORIES

Category	Mean Per Cent	Range
Routine	29.74	11-45
Cognitive-memory	58.71	44-82
Convergent thinking	.89	0[a]- 6
Divergent thinking	2.82	0[a]- 7
Evaluative thinking	11.94	0[a]- 7
X[b]	5.90	2-15

[a] Less than 1%.

[b] Uncodable.

From Table 12 it can be noted that the ranges for the routine and cognitive-memory categories were large as opposed to the productive thinking classes. Thus, in some cases practically all of the students' statements were cognitive-memory, and practically none of them were convergent, divergent, or evaluative thinking. In some classes the students expressed no productive thinking in the classroom discussions.

Analysis of secondary categories

To describe the teacher-pupil verbal interaction in greater detail, the per cents of teacher questions, teacher statements, and student utterances in the secondary categories are given in Table 13. Much variability in the secondary categories of the routine class was found for teacher questions, statements, and student remarks. Practically all teacher questions were in the management sub-category, while for teacher statements the greatest number of units was in structuring, then in the two verdict categories combined, and finally management. These teachers gave twice as many positive verdicts as negative verdicts. This difference was found significant ("$\underline{U}$" = 63; $N_1 = 17$; $N_2 = 17$; $\underline{p} < .02$). Negligible amounts of humor and self reference were found.

Most of the students' utterances were in management, and these were generally responses to the teachers' management questions. Although 6% of the students' remarks were structuring, these differed from the teachers' structuring in that the former generally involved self structuring as opposed to the latter which involved structuring others or the class. The teachers rarely asked for verdicts, and the students seldom volunteered them. Few humor and self

TABLE 13

PER CENT OF TEACHER QUESTIONS, TEACHER STATEMENTS AND STUDENT UTTERANCES IN SECONDARY CATEGORIES

Category	Teacher questions	Teacher statements	Student utterances
Routine			
Management	18.82	12.82	14.82
Structuring	.24	29.35	6.53
Verdict +	.41	13.12	.47
Verdict -	.12	6.88	1.06
Dunno & Muddled	.62	.12	5.12
Humor	0[a]	0[b]	.12
Agreement	2.09	.71	1.01
Self Reference	0[a]	0[b]	.61
Cognitive-memory			
Scribe	1.53	2.94	1.59
Recapitulation	25.59	18.65	30.88
Clarification	4.32	3.35	2.18
Fact Stating	37.47	3.82	24.06
Convergent thinking			
Translation	0[a]	0[a]	0[a]
Association	.53	0[b]	.18
Explanation	1.71	.12	.71
Conclusion	1.06	.06	.35
Divergent thinking			
Elaboration	.82	.06	1.29
Divergent association	1.06	.12	1.35
Implication	.35	.06	.18
Synthesis	0[a]	0[a]	0[a]
Evaluative thinking			
Unstructured	3.47	.94	1.53
Structured	.59	.35	.41
Qualified Judgement	0[b]	0[b]	0[b]

[a] Units did not appear in the tapescripts.

[b] Units appeared in tapescripts, but less than 1%.

reference units were found for the students as well as for the teachers. Five per cent of the student remarks were in the dunno and muddled categories while less than 1% was found for the teachers. This difference was due, in part, to the fact that students primarily respond to questions while teachers do not.

In summarizing the results for the secondary categories of the routine class, it seems that the teacher has sole responsibility for structuring the students and reinforcing their performance. The teachers did not request the students to perform these functions, nor did the students do so without solicitation. On the basis of the findings for the humor, verdict, and self reference categories, it seems that these teachers were trying to create a serious, impersonal and yet supportive classroom atmosphere.

From the secondary categories in the cognitive-memory class it can be noted that the teachers primarily requested facts and recapitulations, and these were the sub-categories in which the students responded most. The majority of teacher statements were in the recapitulation category, and most of these were repetitions of the students' previous correct responses. The role of these repetitions can be explicated by analyzing the different reactions teachers exhibited to the students' responses. In Table 14 the per cent of correct and incorrect student responses that were repeated and/or reinforced by the teacher is shown.

TABLE 14

PER CENT OF CORRECT AND INCORRECT STUDENT RESPONSES REINFORCED AND/OR REPEATED BY THE TEACHERS

	Correct Response (Per Cent)	Incorrect Response (Per Cent)
Reinforcement with no repetition	22	21
Repetition with no reinforcement	21	4
Reinforcement and repetition	10	0^a

[a] Less than 1%.

The teachers gave the same amount of reinforcement (i.e., positive or negative verdicts) to correct and incorrect student responses. However, they repeated significantly more correct than incorrect student responses ("$\underline{U}$" = 5.5; $N_1 = 17$; $N_2 = 17$; $\underline{p} < .001$). Also, they paired repetition and reinforcement to correct responses much more than to incorrect responses. From these findings the writer posits that the teachers were ill-prepared. They were using repetition of the previous correct student response as a means for biding their time to plan the next question. They did not repeat the incorrect response because they paraphrased or repeated the original question or gave the correct answer. That is to say, they did not need time to think of their next action with incorrect responses as they did with correct responses. If the teachers had prepared their lessons better, then such a large amount of repetition might not have been evidenced.

No teacher or student units were classified in the translation sub-category of convergent thinking nor in the synthesis sub-category of divergent thinking. It is possible that these two processes were of too high an intellectual level to be found in special classes for the mentally retarded.

In each of the secondary classes of the three productive thinking categories there was a greater percentage of teacher questions than teacher statements. This seems to indicate that the teachers wanted the students to give these high level responses rather than doing so themselves.

Correlation of teacher questions and student statements

To test hypothesis III that there would be a significant correlation between the thought processes requested by the teachers and those supplied by their mentally retarded students, Spearman rank correlation coefficients were obtained. Correlations were made for each major category by ranking each teachers's questions and each group of student utterances. The correlations for each primary category and the three productive thinking categories combined are shown in Table 15. All coefficients were significant at the .01 level. Special note should be taken of the fact that the highest correlation was obtained for the three productive thinking categories combined. Since hypothesis III was supported, it can be concluded that special class teachers play a crucial role in determining the thought processes expressed by their mentally retarded students.

TABLE 15

SPEARMAN CORRELATION COEFFICIENTS FOR TEACHER QUESTIONS AND STUDENT RESPONSES IN MAJOR CATEGORIES

Category	r_s
Routine	.81
Cognitive-memory	.70
Convergent thinking	.84
Divergent thinking	.70
Evaluative thinking	.62
Productive thinking categories combined	.89

Analysis of the effects of subject matter

To study the effects of subject matter on the teacher-pupil verbal interaction, the amount of teacher questions in the five major categories was analyzed for each subject matter area. Teacher questions rather than statements were selected for analysis because Gallagher (1965) found that questions were influenced by subject matter more than statements. Five, rather than four, categories were used here because it was thought that some subject matters might have more routine units than others. The per cents of teacher questions in each of the five categories for the different subject matter areas are presented in Table 16.

In comparing academic and non-academic subject matter areas it can be seen that there were more routine questions in the latter. This was probably due to the fact that many of the opening exercise activities involved settling routine matters such as collecting lunch money, taking attendance, etc. and that most of the conversations in art classes revolved around the use of art materials. More cognitive-memory, convergent thinking and divergent thinking questions were asked in the academic areas while more evaluative thinking questions were asked in the non-academic areas.

TABLE 16

PER CENT OF TEACHER QUESTIONS IN FIVE PRIMARY CATEGORIES BY SUBJECT MATTER AREAS

		Category				
Subject Matter	N[a]	Routine	Cognitive-memory	Convergent thinking	Divergent thinking	Evaluative thinking
Language arts	17	15.65	73.29	2.59	2.35	5.41
Arithmetic	14	30.28	63.79	4.50	1.21	.21
Social studies	11	17.45	71.54	3.18	2.82	5.00
Science	3	36.67	59.33	2.00	1.00	1.00
Total for academic areas		22.04	68.98	3.29	2.02	3.40
Art	10	51.62	39.75	2.37	.75	5.50
Opening exercises	17	28.06	59.41	1.59	.65	4.65
Total for non-academic areas		35.60	53.12	1.84	.68	4.92

[a] Number of classes in which subject matter was taught.

Within the four academic areas much variability is apparent. The greatest number of routine questions was asked in arithmetic and science. However, the results for science should be viewed with caution because this area was taught by only three of the 17 teachers. Cognitive-memory questions accounted for about 70% of all questions asked in language arts and social studies. This was due to the fact that reading, which is categorized in cognitive-memory, was the major activity in these two areas. Convergent thinking questions were asked in arithmetic more than in any other subject matter. These questions were usually word problems requiring reasoning. Divergent thinking and evaluative thinking questions were most frequent in language arts and social studies. These two subject matter areas were similar in their distributions of teacher questions. Evaluative thinking questions were practically absent from arithmetic. These teachers seemed to view arithmetic as a clear-cut subject not requiring any opinions or speculations.

From these comparisons it can be concluded that the subject matter influences the teachers' questions; and thus, the teacher-pupil verbal interaction.

Inter-correlations of interaction variables

To determine whether patterns of teacher behaviors could be identified, some of the interaction variables were inter-correlated. Through such an analysis it was thought that certain clusters of variables could be identified as characteristic of "effective" teachers. The Spearman rank correlations used for this purpose are shown in Table 17.

TABLE 17

SPEARMAN INTER-CORRELATIONS FOR INTERACTION VARIABLES

	Binary questions	Evaluations	Verdict +	Verdict -	Correcting responses	Dunno & wrong	Student participation
Productive thinking questions	.53[a]	.05	.06	.00	.16	.25	.29
Binary questions		.03	.14	-.36	.22	-.11	-.21
Evaluations			-.16	-.31	-.74[b]	-.20	.18
Verdict +				-.11	.21	-.20	-.36
Verdict -					-.20	.08	.03
Correcting responses						.07	-.23
Dunno & wrong							.26

[a] Significant at .05 level.

[b] Significant at .01 level.

Two variables selected, the amount of productive thinking and binary questions, involved the teachers' questions. Binary questions could only be classified in the evaluative thinking or cognitive-memory question categories (excluding the requoting and scribe sub-categories). Thus, the per cent of binary questions out of the total number of evaluative thinking and cognitive-memory questions (excluding the two above sub-categories) was calculated. The four variables of evaluations, positive verdicts, negative verdicts, and correcting responses involved the teachers' reactions to the students' responses. The amount of dunno and wrong responses produced by the students was viewed as representative of the appropriateness of the level of teacher questions. The per cent of wrong and dunno student responses out of the total number of responses that could be classed as right or wrong was calculated. Evaluative thinking responses could not be classified as right or wrong, and thus were deleted from this analysis. The per cent of student utterances out of the total number of units was used as an indication of the amount of student participation encouraged by the teacher.

Only two inter-correlations were significant. The significant positive correlation between the amount of productive thinking questions and binary questions can be attributed, in part, to the fact that more than a third of all productive thinking questions were in the evaluative thinking category, and 85% of the latter were of a binary nature. Therefore, about a third of all productive thinking questions were also binary questions.

There was a significant negative correlation between the teachers' requests for evaluations of incorrect student responses and correcting responses. To determine the effectiveness of the teachers' requests for evaluations, an analysis was made of who eventually provided the correct answer to the incorrect response being evaluated. The same child who made the evaluation gave the correct response 85% of the time; another child gave it 7% of the time; the teacher gave it 4% of the time; and the question went unanswered 4% of the time. These differences were significant ($\underline{X}^2 = 185.23$; df = 3; $\underline{p} < .001$). Thus, when teachers asked for evaluations they followed through by having the children provide the correct answers rather than doing so themselves.

In summary, no patterns of teacher behavior were found with these interaction variables. This may have been due to the selection of inappropriate interaction variables and/or to the fact that teachers who are "good" in one area are not necessarily "good" in other areas.

Comparison of the E and C Teachers

Analysis of background data

The total number of units for the E classes was 14,403 and 12,819 for the C classes. The mean number of units per class was 1600 and 1602 respectively.

In Table 18 the amount of time in school and the amount of time recorded for these two groups is presented. Both groups were in school for about six hours and were recorded for about three hours. No significant differences were found on these variables.

TABLE 18

NUMBER OF MINUTES IN SCHOOL AND NUMBER OF MINUTES RECORDED FOR E AND C CLASSES

		Minutes in school	Minutes recorded
E group	$\overline{X}$	304.44	165.33
	S.D.	44.33	36.92
C group	$\overline{X}$	317.62	149.50
	S.D.	34.11	33.11

The per cent of the total time in school spent on various subject matter areas for the E and C groups is shown in Table 19. The E group devoted significantly more time to academic subjects ($t = 2.46$; df = 15; $p < .05$), and significantly less time to other areas such as clean up, rest, and periods of no activity ($\underline{t} = 3.52$; df = 15; $\underline{p} < .01$). Thus, it seems that the E teachers were able to spend more time on academic areas by eliminating these other non-essential activities.

In Table 20 the per cent of the total time in school devoted to specific subject matter areas is presented. The E teachers spent more time than the C teachers on each of the four academic subjects; but none of these differences was found significant with "t" tests. However, when the four academic areas were combined a significant difference was found. Therefore, the E teachers divided the extra time taken from the non-essential activities among all the academic areas, rather than devoting all of it to one or two areas.

TABLE 19

PER CENT OF TOTAL TIME IN SCHOOL SPENT ON ACADEMIC, NON-ACADEMIC, AND OTHER AREAS FOR E AND C GROUPS

	Academic Areas	Non-academic Areas	Others (with lunch)	Others (without lunch)
E group	46^a	29	24	3^b
C group	36^a	30	34	10^b

[a] Significant at .05.

[b] Significant at .01.

It should be noted from Table 20 that seven of the E teachers taught social studies as opposed to only four C teachers. This is attributed to the fact that social studies was stressed in Goldstein's training on the experimental curriculum.

TABLE 20

PER CENT OF TOTAL TIME IN SCHOOL ON DIFFERENT SUBJECT MATTER AREAS FOR E AND C GROUPS

Subject matter	E group (N = 9)		C group (N = 8)	
	Per Cent	N[a]	Per Cent	N[a]
Language arts	26	9	26	8
Arithmetic	10	8	6	6
Social Studies	7	7	3	4
Science	2	2	0[b]	1
Music	7	6	4	3
Opening exercises	5	9	6	8
Art	7	4	7	6
Physical education	11	8	14	7
Lunch	21	9	24	8
Other[c]	3	4	10	4

[a] Number of classes in which these activities were found.

[b] Less than 1%.

[c] Clean-up, rest, and periods of no activity.

The per cent of total units for teacher questions, teacher statements, and student utterances for the E and C groups is in Table 21. In both groups the teachers contributed about 65% of the units, 15% of these were questions and 50% were statements, while the students contributed 35% of the units. No significant differences were found between the groups with a X^2 test.

TABLE 21

PER CENT OF TOTAL UNITS FOR TEACHER QUESTIONS, TEACHER STATEMENTS AND STUDENT UTTERANCES FOR E AND C GROUPS

	Teacher Questions	Teacher Statements	Student Utterances
E group	14	50	36
C group	15	50	35

Analysis of E and C teacher questions

As was done with the analysis of the teachers' questions for the total group, only the four operations categories were considered for the E and C teachers' questions. The mean per cent of questions asked by the E and C teachers in these four categories as well as the three productive thinking categories combined is presented in Table 22.

TABLE 22

PER CENT OF E AND C TEACHER QUESTIONS IN MAJOR CATEGORIES

Category	E group		C group	
	$\overline{X}$	Range	$\overline{X}$	Range
Cognitive-memory	89	79-97	86	71-95
Convergent thinking	3	0-10	5	1-24
Divergent thinking	3	0-9	3	1-7
Evaluative thinking	5	2-8	6	1-17
Productive thinking	11	3-19	14	5-28

The C teachers asked slightly more productive thinking questions than the E teachers; however, no significant Mann-Whitney "U's" were obtained for the differences between any of the productive thinking categories individually or in combination. Therefore, hypothesis IV in which it was predicted that the E teachers would ask significantly more productive thinking questions than the C teachers was not supported. A slight trend in the direction opposite the one predicted was noted.

Also in Table 22 the ranges of per cents of teacher questions are presented. Wider ranges were found in the convergent and evaluative thinking categories for the C group. Thus, one C teacher seemed to stress convergent thinking and another evaluative thinking.

Analysis of Secondary categories for E and C teachers

Since Gallagher found individual differences between teachers to be most apparent with the secondary categories (1965), the percentages of teacher questions, teacher statements, and student remarks in the secondary categories are presented in Table 23. The most striking fact to be noted from this table is the great similarity between the E and C groups on all of the sub-categories. The greatest difference found for any category was 5%. Thus, the results in the secondary categories showed a high level of consistency for the E and C groups.

In hypothesis V it was predicted that the E teachers would ask more conclusion questions than the C teachers and the C teachers would give more conclusion statements than the E teachers. Contrary to this hypothesis, Table 23 shows that the E teachers asked less conclusion questions than the C teachers. However, this was due to one extreme scored in the C group which can be noted from Table 24 in which the per cent of conclusion questions for each E and C teacher is presented. The per cent of conclusion statements for the E and C teachers is also depicted in Table 24. No differences were found in this area as 16 of the 17 teachers had

TABLE 23

PER CENT OF TEACHER QUESTIONS, TEACHER STATEMENTS, AND STUDENT REMARKS IN SECONDARY CATEGORIES FOR E AND C CLASSES

Category	Teacher Question		Teacher Statement		Student Remark	
	E	C	E	C	E	C
Routine						
Management	18	20	13	13	17	12
Structuring	0	0	31	28	7	6
Verdict +	0	0	13	13	0	0
Verdict -	0	0	7	6	1	1
Dunno & muddled	0	0	0	0	4	6
Humor	0	0	0	0	0	0
Agreement	1	1	0	1	1	1
Self reference	0	0	0	0	0	0
Cognitive-memory						
Scribe	2	2	3	2	2	1
Recapitulation	25	26	17	20	29	33
Clarification	4	4	3	4	2	2
Fact Stating	39	36	3	4	24	24
Convergent thinking						
Translation	0	0	0	0	0	0
Association	1	0	0	0	0	0
Explanation	2	2	0	0	1	1
Conclusion	1	2	0	0	0	1
Divergent thinking						
Elaboration	1	1	0	0	1	1
Association	1	1	0	0	1	1
Implication	0	0	0	0	0	0
Synthesis	0	0	0	0	0	0
Evaluative thinking						
Unstructured	3	4	1	1	1	2
Structured	1	1	0	0	0	0
Qualified judgement	0	0	0	0	0	0

zero per cent of conclusion statements. It was not possible to statistically test the conclusion question or conclusion statement parts of hypothesis V because most of the teachers neither asked for nor gave conclusions. Thus, most of the ranks of the scores were tied for the same place. Although statistical tests could not be conducted, perusal of the data for the conclusion sub-category in Tables 23 and 24 support the conclusion that hypothesis V was not confirmed.

TABLE 24

PER CENT OF CONCLUSION QUESTIONS AND CONCLUSION STATEMENTS FOR E AND C TEACHERS

E Group		C Group	
Conclusion Questions	Conclusion Statements	Conclusion Questions	Conclusion Statements
0	0	0	0
1	0	0	0
1	0	1	0
0	0	10	0
2	1	1	0
0	0	0	0
0	0	1	0
1	0	0	0
0	0		

In hypothesis VI it was predicted that the C teachers would utter significantly more questions and statements in the factual sub-category than the E teachers. From Table 23 it can be noted that 35% of the C teachers' questions were factual as compared with 39% for the E teachers. Thus, there was a slight trend in the opposite direction predicted. This difference was not found significant with the Mann-Whitney "U" test nor was the difference between the 3% for E teacher statements and 4% for C teacher statements. Therefore, hypothesis VI was not supported, and a slight trend for the E teachers to ask more factual questions was evidenced.

Although no specific hypotheses were projected for the reinforcement given by the E and C teachers, this was analyzed. The E teachers positively reinforced 29% of their students' correct responses while the C teachers reinforced 34%. The E teachers gave negative verdicts to 23% of their students' incorrect responses as opposed to 18% for the C teachers. Neither of these differences was found significant with "U" tests. Thus, the E and C teachers did not differ in the reinforcement they gave to their students' responses.

Analysis of E and C teachers with added categories

In order to evaluate hypotheses VII and VIII it was necessary to analyze the additional codings constructed for these purposes. In hypothesis VII it was predicted that the C teachers would provide significantly more correcting responses after the students' incorrect answers than the E teachers. The C teachers gave correcting responses to 38% of their students' incorrect answers and the E teachers gave 29%. Although the difference was in the predicted direction, it was not significant with a "U" test.

It was proposed in hypothesis VIII that the E teachers would ask for significantly more evaluations after the pupils had incorrectly responded than the C teachers. The E teachers asked for evaluations of 10% of the students' incorrect responses and the C teachers asked for 6%. Again, the difference was in the predicted direction, but the obtained "U" was not significant. Therefore, hypothesis VIII was not confirmed.

Analysis of consistency of E and C teacher questions

In hypothesis IX it was predicted that there would be greater consistency for the E teachers' questions during the course of the school day irrespective of subject matter areas than for the C teachers' questions. In order to evaluate this hypothesis, the percentage of teacher questions in each of five subject matter areas was compared. Because of the expected frequency requirement of the X^2 test, it was necessary to combine the three productive thinking categories into one category. Each of these three resulting categories (i.e., routine, cognitive-memory, and productive thinking) was analyzed with a separate X^2 test. This was done separately for the E and C teachers so that a total of six X^2's were obtained. The values of the X^2's are presented in Table 25. If a significant X^2 was found, then that group of teachers was not consistent in that category from one subject matter to another. Significant X^2's were found for the E teachers on the routine and cognitive-memory categories; whereas a significant X^2 was found for the C teachers in the routine category only. Thus, hypothesis IX was not supported. In fact, the contrary was found (i.e., the E teachers were less consistent than the C teachers).

TABLE 25

X^2 VALUES FOR E AND C TEACHERS ON CONSISTENCY OF QUESTIONS IN DIFFERENT SUBJECT MATTER AREAS (Df = 4)

	Category		
	Routine	Cognitive-memory	Productive-thinking
E group	46.93[a]	22.26[a]	2.86
C group	25.93[a]	7.13	4.07

[a] Significant at .001 level.

Analysis of E and C teacher statements

In Table 26 the distribution of teacher statements in the five major categories is presented for the E and C teachers. As can be noted from this table practically all of the E and C teachers' statements were coded in the routine and cognitive-memory categories. To conduct a X^2 on these data it was again necessary to combine the productive thinking categories so that the expected frequencey requirement could be met. The X^2 obtained was not significant. Therefore, hypothesis X which stated that there would be no significant differences between the E and C teachers' statements in the primary categories was confirmed.

Also presented in Table 26 are the ranges of percentages of the teachers' statements. Ranges for both groups were similar.

TABLE 26

PER CENT OF E AND C TEACHER STATEMENTS IN MAJOR CATEGORIES

Category	E Group $\overline{X}$	E Group Range	C Group $\overline{X}$	C Group Range
Routine	64	51-75	62	41-73
Cognitive-memory	27	17-45	31	17-48
Convergent thinking	1	0-2	0	0-1
Divergent thinking	1	0-3	0	0-1
Evaluative thinking	1	0-4	2	0-4
Productive thinking	3	0-9	2	0-6

Other comparisons of E and C teachers

Although no specific hypotheses were proposed, other comparisons of the E and C groups were made. The number of binary questions asked by the E and C teachers was contrasted. For the E teachers 28% of all questions that could have been binary were so, and for the C teachers 31% was found. The "U" for this difference was not significant.

The E and C teachers were compared on the appropriateness of their level of questioning as indicated by the per cent of dunno and wrong student responses. It was found that 27% of the E students' responses and 34% of the C students' responses were dunno or wrong. Although there was a slight trend for the E students to give less wrong and dunno responses, this difference was not significant.

The number of negative personal verdicts given by the teacher was used as an index of the teacher's ability to discipline the class, while the number of X or uncodable units was used to characterize the noise level of the class. These two variables combined were considered representative of the teacher's ability to manage the class. Of the total teacher statements, 5% were found in the negative personal verdict category for the E teachers and 4% for the C teachers. Six per cent of all utterances were unclassifiable for the E classes and 5% for the C teachers. Neither of these differences were significant with Mann-Whitney "U's." Thus, it seems that the E and C teachers did not differ with respect to discipline or management problems.

Comparison of E and C students

According to Goldstein's description of the E and C methods, the processes used by the students to answer their teachers' questions should differ. To compare the processes used by the two groups of students, the per cents of utterances in the five major categories for the E and C students are presented in Table 27. The X^2 obtained for these data was not significant. Hence, the E and C students did not differ in the processes they used in their classroom interactions.

TABLE 27

PER CENT OF E AND C STUDENT UTTERANCES IN MAJOR CATEGORIES

Category	Group	
	E	C
Routine	30	26
Cognitive-memory	57	60
Convergent thinking	1	2
Divergent thinking	2	2
Evaluative thinking	1	2

Investigation of Teacher and Pupil Background Characteristics

Analysis of teacher characteristics

Nine variables, which seemed to be the most critical aspects of the teacher-pupil interaction, were selected for the analysis of the effects of teacher characteristics. The nine variables centered on the teachers' questions, reactions to student responses, management of the class, and appropriateness of the level of questions. The three productive thinking category questions combined and individually as well as the number of binary questions were chosen for the analysis of teacher questions. The amount of positive and negative verdicts, evaluations, and correcting responses were used as indices of the teachers' reactions to student performance. The teachers' ability to manage the class was judged from the amount of disciplining or negative personal verdicts and routine teacher statements. The appropriateness of the level of teacher questions was inferred from the number of dunno and wrong student responses.

Age: To determine the effects of age, the Y and O groups were contrasted on the nine interaction variables which are presented in Table 28. The O group asked more productive thinking questions; however, this difference was found only for convergent thinking questions. They also asked more binary questions. The Y group gave more positive reinforcement and requested more evaluations while the O group gave more negative reinforcement and correcting responses. However, none of these differences was found significant with "U" tests. Thus, age did not seem to influence these aspects of the teacher-pupil verbal interaction.

TABLE 28

COMPARISON OF Y AND O GROUPS ON INTERACTION VARIABLES (IN PER CENT)

Interaction variable	Age groups	
	Y	O
Productive thinking questions	11	14
Convergent thinking questions	2	6
Divergent thinking questions	3	3
Evaluative thinking questions	5	5
Binary questions	27	31
Positive reinforcement	34	30
Negative reinforcement	20	23
Evaluations	11	6
Correcting responses	32	35
Negative personal verdicts	6	4
Routine statements	63	63
Dunno & wrong student responses	29	32

Age was viewed as a possible influence on personal teaching style. Since style seems to be reflected in the teachers' statements, the per cent of statements in the five major categories was compared for the Y and O groups. The most striking feature of Table 29, which shows these results, is the marked similarity between the groups in all categories. Thus, it seems that age exerted no influence on personal teaching style as reflected in teacher statements.

TABLE 29

PER CENT OF Y AND O TEACHER STATEMENTS IN MAJOR CATEGORIES

Group	Category				
	Routine	Cognitive-memory	Convergent thinking	Divergent thinking	Evaluative thinking
Y	63	28	0[a]	0[a]	1
O	63	30	0[a]	1	1

[a] Less than 1%.

Teacher Preparation: For the analysis of teacher preparation, the teachers were divided into three groups: five teachers with training in special education; five teachers with training in another area of education; and seven teachers with no training in education. A few trends for the three groups can be noted from their performances on the nine interaction variables presented in Table 30. The special education group gave the least amount of negative reinforcement and the most correcting responses.

TABLE 30

COMPARISON OF TEACHER PREPARATION GROUPS ON INTERACTION VARIABLES (IN PER CENT)

Interaction variable	Teacher preparation group			
	Special Education (N=5)	Education (N=5)	Two education groups combined (N=10)	No training in education (N=7)
Productive thinking questions	11	14	13	12
Convergent thinking	3	4	3	6
Divergent thinking	3	4	3	2
Evaluative thinking	5	7	6	4
Binary questions	29	34	32	27
Positive reinforcement	30	32	31	32
Negative reinforcement	17	19	18	26
Evaluations	11	11	11	5
Correcting responses	37	28	33	36
Negative personal verdicts	3	6	4	6
Routine statements	60	64	62	64
Dunno & wrong student responses	32	26	29	32

From this it might be inferred that these teachers were trying to minimize their students' feelings of failure and frustration. The education group asked the most productive thinking and binary questions. As reported previously, these two types of questions were significantly correlated for all teachers. This group also gave the least correcting responses and their students gave the smallest amount of dunno and wrong answers. The group with no training in education asked for the least number of evaluations and gave the most negative reinforcement. These teachers may not have known about the effects of these variables, while the other groups may have learned about them in their education courses.

To statistically compare the three groups, a Kruskal-Wallis one-way analysis of variance was used for each interaction variable. None of the "H's," the statistic used in the Kruskal-Wallis test, was significant. Although some trends were noted, it must be concluded from these statistical results that teacher preparation did not have a significant effect on the teacher-pupil verbal interaction.

In an attempt to further investigate the effects of teacher preparation, the two education groups were combined, and then compared to the group with no training in education. The performance of these two groups also is shown in Table 30. The education groups asked slightly more binary questions, and gave less negative reinforcement and correcting responses. However, none of these differences was found significant with Mann-Whitney "U" tests. The education group requested twice as many evaluations as the other group. This difference approached significance as a "U" of 18 was obtained, and a "U" of 17 or less (with $N_1 = 10$; $N_2 = 7$) was necessary.

From the analyses of the three preparation groups as well as the two groups, it must be concluded that this teacher characteristic did not influence the teacher-pupil verbal interaction.

Professional Experience: To determine the effects of teaching experience, Spearman rank correlations of each of the nine interaction variables and the years of teaching experience were obtained. These are presented in Table 31. Two of the nine correlations were significant, and three approached significance. These findings indicate that the more teaching experience a teacher had, the more productive thinking (especially convergent and evaluative thinking questions) and the more binary questions she asked. The previously reported significant correlation between productive thinking and binary questions is now related to a third variable, years of teaching experience.

The correlation for the number of years teaching and the amount of dunno and wrong student responses approached significance (i.e., .10). The number of dunno and wrong student responses was used as an index of the appropriateness of the level of the teacher's questions. From these results it seems that the longer a teacher has taught, the less appropriate is the level of her questioning in relation to the ability of her students to respond correctly. Although teachers who taught for a longer period of time asked more productive thinking questions, these questions were not appropriate to the ability level of the students.

The number of years of teaching experience with the mentally retarded was correlated with each of the interaction variables. These Spearman correlations are also found in Table 31. The only two significant correlations found were with the number of convergent thinking and evaluative thinking questions asked.

From these two sets of analyses it can be concluded that the variable of teaching experience influences the nature of the questions asked. To determine whether the quantity of questions asked was also affected, correlations were made for the number of teacher questions asked and the years of teaching experience as well as the years of teaching the mentally retarded. Neither of these Spearman correlations were significant. Therefore, it appears that the teacher variable of professional experience affects the

TABLE 31

SPEARMAN CORRELATIONS FOR INTERACTION VARIABLES AND YEARS OF TOTAL TEACHING EXPERIENCE AND EXPERIENCE WITH THE MENTALLY RETARDED

Interaction Variable	Years of total teaching	Years with mentally retarded
Productive thinking questions	.47[a]	.34
Convergent thinking	.40[b]	.43[a]
Divergent thinking	.27	.20
Evaluative thinking	.39[b]	.47[a]
Binary questions	.47[a]	.27
Positive reinforcement	-.10	.03
Negative reinforcement	.04	.04
Evaluations	-.31	.35
Correcting responses	.28	.22
Discipline	.30	.08
Routine statements	.37	-.20
Dunno & wrong student responses	.40[b]	.26

[a] Significant at .05 level.

[b] Significant at .10 level.

quality, but not the quantity of teacher questions.

In conclusion, of the teacher variables of age, professional training, and teaching experience, only the last seemed to influence the teacher-pupil verbal interaction; however, this influence was limited solely to the nature of the teacher questions.

Effects of pupil characteristics on teacher performance

The pupil characteristics of C.A., I.Q., M.A., and class size were correlated with the nine interaction variables to determine their effects on the teacher's verbal behavior.

The Spearman correlations for the pupil characteristics and the nine interaction variables are presented in Table 32. Significant negative correlations were found between the amount of positive reinforcement and the mean C.A., I.Q., and M.A. of the class. Therefore, the younger the class, chronologically or mentally, and the lower the I.Q.'s of the class, the more positive verdicts or support given by the teacher. None of the other correlations was significant.

In hypothesis XI a significant negative correlation between the number of binary questions asked by the teacher and the mean I.Q. of the class was predicted. As can be noted from Table 32 a non-significant correlation of .05 was obtained; therefore, this hypothesis was not supported.

It can be concluded that the pupil characteristics of C.A., I.Q., and M.A. influenced the teacher only in terms of the amount of positive reinforcement she gave. Of the four pupil characteristics, class size seemed to be least important.

TABLE 32

SPEARMAN CORRELATIONS FOR PUPIL CHARACTERISTICS AND INTERACTION VARIABLES

Interaction Variable	Pupil Characteristics C.A.	I.Q.	M.A.	Class Size
Productive thinking questions	.22	.37	.28	.12
Convergent thinking	.13	.23	.12	.15
Divergent thinking	.18	.22	.26	.02
Evaluative thinking	.25	.10	.15	.27
Binary questions	.09	.05	.18	.02
Positive reinforcement	-.48[a]	-.58[a]	-.51[a]	-.30
Negative reinforcement	.12	.00	.12	.02
Evaluations	-.03	.12	.09	.26
Correcting responses	.09	.07	.12	.01
Discipline	-.13	-.02	.10	.24
Routine statements	-.34	-.03	-.31	.23
Dunno & wrong student remarks	.26	.35	.33	.06

[a] Significant at .05 level.

Effects of pupil characteristics on classroom verbal behavior

The pupil characteristics were correlated with the amount of productive thinking student remarks to ascertain their effects on the students' verbal behavior in the classroom. In Table 33 the Spearman correlations are presented.

TABLE 33

SPEARMAN CORRELATIONS FOR PUPIL CHARACTERISTICS AND STUDENT REMARKS IN FOUR MAJOR CATEGORIES

Category	Pupil characteristics			
	C.A.	I.Q.	M.A.	Class Size
Cognitive-memory	.45[a]	-.23	.34	.23
Convergent thinking	.23	.43[a]	.29	.05
Divergent thinking	.28	.41[b]	.40[b]	.06
Evaluative thinking	.06	-.04	.12	.36
Productive thinking	.25	.32	.36	.17

[a] Significant at .05.

[b] Significant at .10.

The pupil variable of C.A. was significantly correlated with the amount of cognitive-memory student remarks. There was a significant correlation of I.Q. and convergent thinking. The correlations for divergent thinking and I.Q. and M.A. approached significance (i.e., significant at .10 level). Class size had no effect on the students' classroom performance. In conclusion, it seems that C.A., I.Q., and possibly M.A., are factors which influence the amount of cognitive-memory, convergent and divergent thinking statements made by the students. Evaluative thinking statements were not influenced by any of the pupil variables.

Summary of Results

Description of the teacher-pupil verbal interaction

The first two hypotheses involved the teachers' questions. Hypothesis I, in which it was predicted that the distribution of teacher questions in order of greatest frequency would be cognitive-memory, convergent thinking, and then divergent and evaluative thinking, was supported only for the cognitive-memory category. The order found was cognitive-memory, and then equal amounts of divergent, evaluative, and convergent thinking. Significantly more than 50% of all teacher questions were cognitive-memory; thus, hypothesis II was supported. Practically all of the teachers' questions were in the cognitive-memory category.

For teacher statements two-thirds were in the routine category, while the remainder were cognitive-memory. Negligible amounts of productive thinking teachers' statements were found. From the secondary categories the teacher seemed to have sole responsibility for structuring and reinforcing the students. These teachers gave significantly more positive than negative verdicts.

The significant correlation between the thought processes requested by the teachers and those expressed by the students (predicted in hypothesis III) was found. Thus, the teachers seemed to have a critical role in determining the productive thinking expressed by their students.

Differences in teacher questions were found between academic and non-academic subjects as well as between specific subject matters.

No patterns of teacher behaviors were found from inter-correlations of the interaction variables.

Comparison of E and C teachers

Hypotheses IV through IX involved comparisons of the E and C teachers in terms of their teaching methods. None of them was supported. Therefore, the E teachers were not using the inductive teaching method, but rather they were employing the same methods as the C teachers. The only difference between the E and C teachers favoring the E teachers was the superficial one regarding the time spent on academic as opposed to non-educational activities.

Hypothesis X, in which no difference for E and C teacher statements was predicted, was confirmed.

Investigation of teacher and pupil background characteristics

The teacher characteristics of age and professional training did not influence the teacher-pupil verbal interaction. Teaching experience was found to be a relevant factor to the type of questions asked by the teacher.

The pupil characteristics of C.A., M.A., and I.Q. influenced the teachers' verbal behavior only in terms of the amount of positive reinforcement given. No significant correlation for binary teacher questions and class I.Q. was found; therefore, hypothesis XI was not confirmed. Class size seemed to be an unimportant variable to the teacher-pupil verbal interaction. The variables of I.Q., M.A., and C.A. seemed to influence the students' classroom performance.

CHAPTER V

DISCUSSION

Review of the Study

Before discussing the findings of this study, a concise review seems to be in order.

Statement of the problem

The three objectives of this study were to: (1) describe teacher-pupil verbal interactions in special classes for the mentally retarded with special reference to how the teacher uses her language to promote productive thinking in her students, (2) to compare teacher-pupil verbal interactions of teachers instructed in the use of a teaching method designed to enhance productive thinking in the mentally retarded (i.e., the inductive method) with teachers using other methods, and (3) to investigate the effects of teacher and student background characteristics on the teacher-pupil verbal interactions in special classes for the mentally retarded.

Method

Seventeen teachers of special classes for the mentally retarded in New Jersey served as subjects for the teacher sample. The nine teachers were given 32 training sessions on the inductive teaching method and an experimental curriculum. No training was given the eight C teachers. The 167 mentally retarded pupils of these 17 teachers comprised the student sample.

Each class was tape-recorded for one full day. The tapescripts were analyzed with the Gallagher-Aschner Classification System by two judges.

Results

Description of the Teacher-Pupil Verbal Interaction. Analysis of the tapescripts showed that practically all of the teachers' questions were of the cognitive-memory type. The distribution of their question in order of greatest frequency was cognitive-memory and then equal amounts of evaluative, divergent and convergent thinking. Practically all of the teachers' statements were coded as routine or cognitive-memory. Significant correlations between the thought processes requested by the teacher and those expressed by the students were found.

Comparison of the E and C Teachers. None of the comparisons between the E and C teachers yielded significant difference; therefore, the two groups of teachers did not differ in their teaching methods.

Investigation of Teacher and Pupil Background Characteristics. The teacher characteristics of age and professional training were not correlated with any of the measures of the teacher-pupil verbal interaction. The amount of teaching experience was related to the types of teacher questions asked.

The pupil characteristics of C.A., M.A., and I.Q. were correlated with the amount of positive reinforcement given by the teacher, but none of the other measures of the teacher-pupil verbal interaction. Significant correlations between the type of thought processes expressed by the students in the classroom and the variables of C.A., I.Q., and M.A. were found.

Description of the Teacher-Pupil Verbal Interaction

To accomplish the first objective of this study (i.e., a description of the nature of the teacher-pupil verbal interaction), the results for the teachers' questions and statements are discussed. Three of the eleven proposed hypotheses concerned the description of the teachers' questions. No hypotheses related to the teachers' statements were posited; therefore, this aspect of the discussion centers on the descriptive data obtained.

Teacher questions

Hypothesis I. In Hypothesis I the predicted order of greatest frequency for teacher questions was cognitive-memory, convergent thinking, and then equal amounts of divergent and evaluative thinking. Of all teacher questions, 88% were classified as cognitive-memory, 4% as convergent thinking, 3% as divergent thinking, and 5% as evaluative thinking. With the non-parametric "U" test, the order found was cognitive-memory, evaluative thinking, and then equal amounts of divergent and convergent thinking. However, it did not seem meaningful to differentiate between one and two per cent differences. Thus, the "t" test which considers the size of differences was used. The order obtained from use of parametric statistics was cognitive-memory and equal amounts of convergent, divergent, and evaluative thinking. Therefore, Hypothesis I was supported only for the cognitive-memory category.

These results differ from those of Gallagher (1965) who found the order originally predicted in Hypothesis I. Gallagher's classes for the gifted were similar to the classes for the mentally retarded because in both cognitive-memory teacher questions predominated. They differed because in the former convergent thinking was the form of productive thinking most stressed by the teacher; whereas, in the latter no one type of productive thinking was given special attention. However, an analysis of the ranges indicated that the few teachers of the retarded who stressed productive thinking, stressed convergent thinking more than the others.

Hypothesis II. In Hypothesis II it was predicted that the average amount of cognitive-memory questions asked by the teachers would be significantly greater than 50% of all questions asked. This hypothesis was supported as the mean of 88% obtained was significantly greater than 50%. The range of 71 to 97% for cognitive-memory teacher questions indicates that all teachers studied stressed cognitive-memory much more than productive thinking.

Similar results for teacher questions were found by Cawley and Chase (1966) who also used teachers of the mentally retarded. More productive thinking and less cognitive-memory questions were asked by teachers of gifted high school students (Gallagher, 1965). The amount of cognitive-memory questions in classes for normal elementary school children was mid-way between those for teachers of the gifted and those of the retarded (Hughes, 1959). From these four studies it is evident that teachers of elementary level mentally retarded children ask the most cognitive-memory questions, then teachers of normal elementary school children, and finally teachers of gifted high school students. An inverse relationship exists for productive thinking teacher questions (i.e., teachers of gifted high school students ask the most productive thinking questions, etc.). Thus, the amount of productive thinking stressed by the teacher in the classroom discussion is partially determined by the age and the intellectual level of the class.

Hypothesis III. A significant positive correlation between the thought processes requested by the teachers and those supplied by their mentally retarded pupils was predicted in Hypothesis III. All correlation coefficients obtained were significant; hence, Hypothesis III was supported. The teacher's critical role in initiating and determining the thought processes expressed by the students in the classroom has been demonstrated with gifted high school students by Gallagher (1965); normal elementary school pupils by Taba, et. al. (1964), and mentally retarded elementary level children by this writer. A somewhat optimistic view of the teacher's role in educating the intelligence of all types of children seems to be warranted. However, this optimism must be tempered with the recognition of the fact that the student's optimal level of intellectual functioning limits the extent to which the teacher can enhance his productive thinking.

Teacher statements

The per cent of teacher statements in the major categories was 63% routine, 29% cognitive-memory, and 1% or less in each of the three productive thinking classes. The range for the routine and cognitive-memory categories were relatively large (i.e., 41 to 75% for the former and 17 to 48% for the latter), but the ranges for the productive thinking categories were constricted, the largest being 0 to 4%. These data indicate that these teachers were primarily concerned with managing the classroom routine and secondarily with giving factual information. These teachers did not give any productive thinking statements. These findings differ from Gallagher's (1965) in that he found less routine and more productive thinking.

These teachers' pre-occupation with management is attributed to two factors, inability to discipline or control the class and inadequate preparation of the lesson. Negative personal verdicts and uncodable teacher statements were used as indices of the teacher's ability to discipline the class. Although a mean of 5% of all teacher statements were coded as negative personal verdicts, three teachers had over 10% (i.e., 17, 14, and 11%). These teachers spent much of their time unsuccessfully trying to control their classes. This drained much time from their teaching time which was already limited by many non-academic activities. Thus, the three teaching hours out of the six hours in school were further reduced by the time devoted to trying to maintain control.

A mean of 6% of all the teachers' statements was uncodable. For two teachers 17 and 15% were found. These teachers did not try to control their classes, but tried to teach while the children were misbehaving. Because of the high noise levels found in these classes, it often was not possible to hear what the teacher was saying in the classroom or on the tape recording. With these teachers much of their teaching time was wasted because they were not heard by the students.

A large amount of teacher statements in the management sub-category revolved around deciding upon and finding materials for the lessons. Many of these statements indicated that the teachers had inadequately prepared their lessons. The teachers' repetition of the students' correct responses, but not their incorrect responses, was interpreted as a means of biding time so the next question could be planned. This was attributed to inadequate lesson planning.

The statistical findings for the teachers' poor control of the class and inadequate lesson preparation were corroborated by the observations of the writer and the consultant for the E teachers employed on the Goldstein project. The writer served as supervisor for all tape recordings and observations made of Goldstein's E and C classes in the year following this study. From the analyses of monthly tape recordings and observations by naive college students, it was consistently found that discipline was one of the teachers' major problems. It was concluded that the teachers were ill-prepared on the basis of the following frequent observations: not knowing what lesson or page a group was on; not knowing what questions to ask by long pauses between student responses and the next question; thinking aloud about what to do next; etc. The consultant stated that much of his time with the E teachers was devoted to the pressing problems of disciplining and managing the classroom's affairs.

The teacher-pupil interaction and the educability of intelligence

One of the purposes of this study was to describe the teacher-pupil verbal interaction with special reference to how teachers use their language to promote productive thinking. In this study stimulating productive thinking was equated with educating intelligence. Currently, the notion that intelligence can be modified has been accepted by most writers in special education and psychology. Whether the teachers of the retarded, who have the responsibility for educating intelligence, attempt to do so has not been investigated heretofore.

The descriptive results of this study indicate that teachers can influence the thought processes expressed by their students in the classroom (Hypothesis III). Thus, to some extent, teachers can educate intelligence as it is manifested in the classroom. Although teachers of the retarded can influence productive thinking in the classroom, they do not. They stress cognition and memory almost to the exclusion of any of the three forms of productive thinking (Hypotheses I and II). Thus, the question of why so many cognitive-memory questions and so few productive thinking questions were found is raised. The writer believes that the explanation for teacher deficiency in stimulating productive thinking may be found in one of the following:

1. The teachers could not recognize any differences between various types of questions.
2. The teachers could discriminate between different types of questions, but they were unable to incorporate these differences into their actual questioning behavior.
3. The teachers believed their mentally retarded students were not yet "ready" for productive thinking.
4. The teachers believed their mentally retarded students were incapable of doing any productive thinking.

1. It is possible that the teachers did not ask productive thinking questions because they could not recognize any differences between various types of questions. Thus, they did not know that different types of questions required different types of thought processes from the students. This lack of knowledge is attributed to inadequate teacher preparation. It appears likely that approaches to teacher questions were neither discussed, analyzed, nor practiced in the teachers' professional training.

The lack of discrimination of different types of questions seems to be related to a broader problem noted by the writer. Although some of these teachers appeared to have specific adacemic goals for their students, they did not seem to have strategies or plans for achieving these goals. That is, they did not seem to be guiding the children to desired learnings. Rather, they were responding to situations as they arose instead of creating incidents leading to desired learnings. They were reacting rather than acting or managing the learning. The writer contends that these teachers did not know how to plan, select, and implement appropriate strategies. Thus, they did not know how to discriminate or use different types of questions which would be involved in different strategies. This deficiency is also attributed to inadequate teacher preparation.

2. It is possible that the teachers could discriminate between different types of questions, but were unable to incorporate these differences into their actual questioning behavior. That is, they could discriminate various questioning approaches intellectually, but they could not make these approaches operational.

This, too, is attributed to inadequate teacher training. Different questioning approaches may have been discussed, but adequate practical experiences were not provided.

In addition, poor lesson planning by the teachers may be a correlate of this factor. In order to put different questioning approaches into operation, it is necessary to plan the lesson in great detail by shaping key questions anticipating possible responses, and flexibly altering one's behavior accordingly. As previously stated, both the writer and the consultant believed that most of the teachers were ill-prepared.

3. These teachers may have believed their students were not yet "ready" for productive thinking as they had not yet mastered basic facts and academic skills. With this explanation it is assumed that even if the teachers could ask productive thinking questions, they would not because they thought it was first necessary to build a foundation of facts and skills (by asking cognitive-memory questions) before introducing productive thinking.

Implicit in this explanation is an underlying issue which must be uncovered; that is, whether the building of a foundation of facts and skills can occur simultaneously with attempts at enhancing productive thinking. From the results of this study it might be concluded that these teachers believed stress on a cognitive-memory foundation precluded any attention to productive thinking.

This writer agrees with Bruner (1961) and Goldstein (1963) who state that productive thinking can be introduced at an early age, and that this foundation can be built upon and elaborated through the years. Thus, the development of productive thinking can and should occur simultaneously with the development of a foundation of basic facts and skills.

4. These teachers may have asked few productive thinking questions because they believed their mentally retarded pupils were incapable of any forms of productive thinking. With this explanation it is assumed that even if the teachers knew how to ask productive thinking questions, they would not because of their constricted beliefs, attitudes, and educational philosophies regarding the mentally retarded. Although this explanation is similar to the third one, the critical difference is that in the former the retarded are viewed as eventually being capable of productive thinking, but not at their present developmental level, while in this explanation the retarded are viewed as always being incapable of productive thinking. The question of whether or not the mentally retarded are capable of productive thinking is not involved here, only the teachers' beliefs on this subject are relevant.

In conclusion, the writer believes that all four explanations are tenable. However, on the basis of her observations and discussions with these teachers, the writer favors the first explanation that these teachers did not know how to discriminate between various types of questions.

Results as related to research on the efficacy of special classes

There seems to be a relationship between the descriptive findings for this study and those of studies comparing mentally retarded children in special classes with such children in regular classes. After a comprehensive review of such comparative studies, Kirk (1964) concluded that retarded children in the regular grades are superior academically to retarded children in special classes. However, Kirk warned that this conclusion should be viewed circumspectly because of many uncontrolled research problems. Although Goldstein, Moss, and Jordan (1965) designed their study to control for these research problems, they found that higher I.Q. retarded children in regular classes were academically superior to such children in special classes. Thus, Kirk's tentative conclusion was given more substantial support.

The writer postulates that certain characteristics found in the special classes of this study would not be found in regular classes, and that these differences may be responsible for the achievement differences found. For example, in regular classes there would probably be more productive thinking questions; less pre-occupation with management problems and thus more teaching would take place; and less attention to the teaching of routines and a cognitive-memory foundation. Hence, the retarded children in the regular grades might be exposed to more teaching and more productive thinking which may result in their superior academic achievement.

If, in the future, any such comparative study is conducted, the regular and special class verbal interactions should be tape-recorded to determine whether these posited differences do indeed exist.

Comparison of E and C Teachers

Hypotheses related to the E and C teaching methods

Seven hypotheses were designed to determine whether the E teachers were using the inductive method as described by Goldstein, and whether the E and C teaching methods differed.

Hypothesis IV. It was predicted in Hypothesis IV that the E teachers would ask more productive thinking questions, especially convergent and divergent thinking questions, than the C teachers. No significant differences between the E and C teachers' questions were found in convergent, divergent, and evaluative thinking nor the productive thinking categories combined. Since the E method was designed to develop the retarded child's problem solving ability through the use of inductive reasoning, convergent thinking questions should have been stressed. The E teachers did not ask more convergent thinking questions than the C teachers, and both groups asked small amounts of convergent thinking questions. Thus, neither group was attempting to develop their retarded students' problem solving ability through inductive reasoning. The results for divergent thinking are at variance with Tisdall's finding that there was more divergent thinking when teachers used the inductive method (1962).

Hypothesis V. It was proposed that the E teachers would ask significantly more conclusion questions than the C teachers, while the C teachers would give significantly more conclusion statements than the E teachers. Statistical tests could not be conducted because most of the E and C teachers neither asked for nor gave conclusions. However, it was obvious that there were no differences between the E and C groups on conclusion questions or conclusion statements; and thus, Hypothesis V was not supported. The E teachers were not encouraging their students to "discover" solutions to problems as was expected on the basis of Goldstein's description of the inductive or "discovery" method.

Hypothesis VI. In this hypothesis it was predicted that the C teachers would utter significantly more questions and statements in the factual sub-category than the E teachers. No significant differences between the E and C groups were found for factual questions or statements. In fact, there was a slight trend for the E teachers to ask more factual questions. Both groups asked a large amount of cognitive-memory questions, almost to the complete exclusion of all other types of questions. Goldstein's attempts at discouraging the E teachers from concentrating solely on fact dispensing seem to have been unsuccessful.

Hypothesis VII. It was proposed that the C teachers would provide significantly more correcting responses after the students' incorrect responses than the E teachers. Although the C teachers did give more correcting responses than the E teachers, this difference was not significant.

Hence, one of the most critical aspects of Goldstein's inductive method was not found.

Hypothesis VIII. It was predicted that the E teachers would ask for significantly more evaluations after the pupil has incorrectly responded than the C teachers. The results were in the predicted direction, but were not significant. Hence, the E and C teachers did not differ in their feedback to incorrect student performance.

Hypothesis IX. A greater consistency for the E teachers' questions during the course of the school day irrespective of subject matter area than for the C teachers was predicted. Neither group was consistent in their questioning behavior in different subject matter areas. Contrary to expectation, the E teachers were less consistent than the C teachers. The results showed that the E teachers were not using the inductive method, and whatever methods they were using varied with the subject matter area being taught.

Hypothesis X. It was predicted that there would be no significant differences between the E and C teachers' statements in the primary categories. This hypothesis was supported as no significant differences were found. However, this lack of difference was probably not due to the fact that the teachers' personal teaching styles were reflected in their statements as previously proposed. Rather, this was due to the fact that most of the E and C teachers' statements were in the routine category (63% of each group). Thus, rather than personal teaching style, the E and C teachers' pre-occupation with management problems was reflected in their statements.

Summary. On the basis of Goldstein's description of the E and C methods, five major differences were outlined earlier. The results obtained in this study are related to these proposed differences as follows:

1. The types of questions asked by the teachers. On the basis of the lack of statistical support for the three hypotheses contrasting the E and C teachers' questions (i.e., IV through VI), this proposed difference was not substantiated.

2. The types of cues provided by the teachers. This was not investigated in this study.

3. The processes used by the students to answer the teachers' questions. The non-significant statistical result obtained for the E and C students' utterances leads to the rejection of this proposed difference.

4. The teachers' feedback to incorrect student performance. No support for the two hypotheses dealing with this area was obtained. Hence, this proposed difference was not also not confirmed.

5. The amount of responses made by the students. No differences were obtained so this proposed difference was not supported.

All four of the proposed differences analyzed in this investigation conclusively indicated that the E teachers were not using the inductive method as described by Goldstein; but rather they were using the same methods as the C teachers.

Interpretations of the findings on the inductive method

The writer believes that the explanation of why the E teachers did not use the inductive method may be found in one or more of the following:

1. The training given the E teachers was inadequate.

2. There was a selection factor in the formation of Goldstein's two treatment groups.

3. The teachers could not change their behavior.

4. The E teachers had used the inductive method at one time, but they found that it was unsuccessful with the mentally retarded so they discontinued using it.

1. The training in the inductive method given the E teachers may have been inadequate for two reasons. First, it primarily consisted of lectures on the nature of the inductive method and experimental curriculum. No actual models of inductive teaching were provided. Secondly, the E teachers were not given supervised practice with the method. Although a consultant visited each E teacher once or twice a month, it was not possible to provide supervised practice with the method because of the more pressing problems of discipline, obtaining sufficient materials, etc. Therefore, Goldstein's training by the lecture method taught these teachers what the inductive method is, but not how to use it.

Although the substance of the E training (i.e., what was taught) differed from the substance of traditional teacher training programs, the technique of training (i.e., how the substance was presented) did not. Both utilize the lecture method. Thus, the E and C teachers probably differed in what they could say about teaching methods, but not in how they could teach. The technique as well as the substance of teaching training must be altered if behavior changes in teachers are to be affected.

2. Since the teachers volunteered to participate in the

E and C groups, there may have been a selection factor in the formation of these groups. It seems that the teachers who volunteered for the E group were those who felt they most needed assistance, while those who volunteered for the C group volunteered to have their classes tape-recorded, observed, etc. without receiving any benefits. Thus, it is plausible that the most secure teachers volunteered for the C group. It is not possible to determine whether the E and C groups initially differed because they were not compared before training was given.

3. The teachers may have been unable to change their teaching behavior. Two possible reasons might be responsible. First, these teachers might have been too rigid to change. Secondly, one year of training may have been inadequate for effecting changes in teaching habits which are so well ingrained.

If this interpretation is valid, then training in the inductive method (or any teaching method) must be commenced in the initial years of teacher training before any teaching habits have been acquired. In view of this explanation, a pessimistic view of re-training teachers must be taken.

4. It is possible that the E teachers had used the inductive method at one time, but they found that it was unsuccessful with the mentally retarded so they stopped using it. The lack of success of this method may be due to the fact that it requires the use of many high level intellectual processes which the mentally retarded pupil may not have at his command.

Although this explanation is possible, the writer does not favor it because it is thought that the teachers were never able to use the inductive method so they were never able to assess its adequacy with the mentally retarded.

This writer favors the first interpretation, that the training given the E teachers was inadequate. It seems that if teachers are to be trained to use the inductive method, or any teaching method, they must be given models of teaching behavior to be emulated as well as extensive supervised practice in the classroom setting.

In conclusion, because of the results obtained for the E and C teachers, it is impossible to evaluate the claim that the inductive method contributes to the development of independent thinking in the mentally retarded.

Description of Teacher and Pupil Background Characteristics

Teacher Characteristics

As previously stated, no specific hypotheses regarding relationship of teacher characteristics and the classroom interaction could be proposed because of the absence of any background literature on which to base such hypotheses.

Age.--A comparative rather than a correlational approach for the effects of age was used because of the dichotomous age distribution found. There were no teachers in the middle age bracket because this is the period when most female teachers retire to bear and rear their children.

No differences for the Y and O groups were found on any of the interaction variables. Thus, the following inferences might be drawn.

1. Since the preparation of teachers with training in education and special education was similar for both age groups, it is possible that the nature of teacher training programs has not changed substantially over the years. Young and old teachers may differ in what they learned about education during their training, but not in how they learned to teach.

2. The life experiences of middle age, especially raising children, seem to have no relationship to a teacher's classroom behavior.

Teacher Preparation.--There were no differences on the interaction variables for the comparisons of the three preparation groups (i.e., training in special education, other areas of education, and no education) nor for the two groups of education vs. no education. These results must be viewed with some caution because of the small numbers in each groups and the use of non-parametric statistics which make significant differences difficult to obtain.

However, the writer believes that even with these statistical limitations, important, albeit tentative, implications can be made for the nature of teacher training programs. The writer's examination of course offerings and outlines of various training programs substantiated these results. In most programs curricula and materials are stressed, while teaching methods are treated tangentially. These programs seem to train teachers in what to teach, and not how to teach. If these observations are correct, then the absence of any effects of teacher training on the teacher's classroom interactions are to be expected.

Teacher Experience.--A correlational approach to the analysis of this variable was used because of the continuous distribution found. The results indicate that teaching experience was correlated with the types of questions asked by the teachers. The total years of teaching was related to the amount of productive thinking and binary questions. The number of years teaching the mentally retarded was positively correlated with the amounts of convergent and divergent thinking questions.

The writer believes that questions were the only variables related to experience because teachers discover through experience that their questions are the most important aspect of their teaching behavior. Thus, through trial and error they probably learn how to ask questions other than simple memory ones.

Of the three types of productive thinking questions, divergent thinking was the only one not found to be correlated with years of total teaching or years of teaching the mentally retarded. Two interpretations of these findings are proposed:

1. The development of divergent thinking, or creativity, may not have been recognized as being within the educational domain by these teachers since this area is

relatively new in education. If it was recognized as an educational goal by these teachers, it was done so recently, and thus would not have been reflected in the years of experience.

2. Without supervision, it may be more difficult to learn how to ask divergent thinking questions than convergent and evaluative thinking questions.

In conclusion, it seems that experience is a better source of learning about some forms of productive thinking questions than existing teacher training programs.

Student Characteristics

Effects of pupil characteristics on teacher performance.--To determine the effects of pupil characteristics on teacher performance, the pupil characteristics were correlated with the interaction variables. The only significant results obtained were the negative correlations of I.Q., C.A., and M.A. with the amount of positive reinforcement. As might be expected, teachers give more support to younger children (i.e., mentally or chronologically).

The writer expected significant positive correlations for I.Q. and M.A. with teacher questions. In Hypothesis XI a significant negative correlation of the amount of binary questions and the mean I.Q. of the class was predicted.

The non-significant correlation obtained (.05) was similar to Spradlin and Rosenberg's finding (Spradlin, 1963). The absence of any relationship between the levels of intelligence of the students and the amount of productive thinking or binary questions may be attributable to one or more of the following factors:

1. The use of group means to study the students' characteristics is questionable. It is likely that the teacher does not teach to the mean I.Q. or M.A. of her class because she usually does not work with the full class simultaneously. Rather, she works with groups of children or individuals. Hence, if she does alter her questioning behavior, it is in relation to the group or individual with whom she is working. Furthermore, the teacher probably selects the amount of productive thinking or binary questions in relation to the slowest rather than the average child.

2. If the teacher is affected by the students' characteristics, she is affected by her perceptions of these characteristics which may not be congruent with objective measures of them. From subsequent conversations with these teachers, it was learned that many of them were unaware of their students' exact I.Q.'s and M.A.'s; and thus,

they had only their perceptions to guide them. Smith, in his theory of teaching, states that a teacher's behavior toward a student is determined by her diagnosis of his interests, readiness, etc., which, in turn, is based on her perceptions of his behavior (1961). The writer believes that an investigation of the effects of student characteristics on teacher behavior must be based on the teachers' perceptions rather than objective measures.

3. Since all students were mentally retarded, the ranges of I.Q.'s and M.A.'s were constricted. With such slight differences between students, the teachers probably had no reason to alter their amounts of productive thinking and binary questions.

Effects of student characteristics on classroom verbal behavior.--Significant positive correlations of C.A., I.Q., and M.A. with the thought processes expressed by the students in the classroom were obtained. It was found that I.Q. was correlated with convergent and divergent thinking student remarks, while M.A. was related to divergent thinking only. Evaluative thinking was not related to any student characteristic. As mentioned earlier, there is some doubt as to whether most of the evaluative thinking remarks should be considered as productive thinking because they were answers to "do you like" questions. No higher level thought process seemed to be involved in such utterances.

These results are at variance with those obtained by Taba, et al. (1964) indicating no relationship of I.Q. with the level of thought expressed in the classroom. This writer attributes this disparity to the previously stated methodological problems of the Taba study (i.e., the use of only one judge to code the data and the exclusion from the analysis of low I.Q. children who never participated in the classroom discussion). The writer believes that this study's findings for the relationships of I.Q. and M.A. with the thought processes expressed in the classroom are tenable. If these findings are not accepted, then it is necessary to ignore the voluminous literature indicating high positive correlations between school performance and I.Q.

Limitations of the Study

The limitations of this study stem from three sources: those from research on classroom interaction; those from such research with the mentally retarded; and those from this particular study.

Limitations of research on classroom interaction

(1) Any study on classroom interaction is bound by the classification system and the theoretical foundation employed. The intellectual aspect of classroom interaction encompasses a very broad spectrum of behavior. Therefore, any classification system must ignore some behaviors and over-simplify others. It is not possible to parsimoniously include all intellectual behaviors found in the classroom, and arrive at a meaningful description.

This problem is further complicated by the fact that there is no one universally accepted theory of intelligence. Classification systems are based on different theories, and thus look at different behaviors, which makes comparisons between systems difficult.

Since the field of interaction analysis is very young, the classification systems are new and have been used in only a few studies heretofore. These classification systems are best viewed as tentative ones, which, through repeated application to different samples, can be used as the bases for the development of improved systems.

Although the Gallagher-Aschner Classification System, like all such systems, suffers from the above limitations, the writer believes that it is presently the best available in terms of reliability and meaningfulness.

(2) Inherent in this type of interaction analysis is the most difficult problem of inferring the thought process underlying a question or statement. A judge may devote hours and even days laboring over the decision as to the thought process underlying one unit. After these tedious decisions are made, the coefficients of agreement between the judges may not approach respectability.

This inference problem is further complicated with mentally retarded subjects. Bizarre student responses having no apparent relation to the teacher's question nor the topic are not infrequent. It is difficult to decipher the meaning of such remarks, and practically impossible to infer the underlying processes.

However, the writer believes that the value of analyzing thought processes underlying the classroom verbal interaction far outweighs these problems.

(3) The application of traditional statistical methods to the data of classroom interaction is difficult. Parametric statistics, developed and utilized in stringent biological and psychological research, are difficult to use in interaction analysis because they often do not fit the nature of the data and because the underlying assumptions usually cannot be made.

Non-parametric statistics may fit the data of interaction analysis better than parametric statistics because the data are discrete categories rather than continuous variables and because no assumptions about the distributions of the populations and their variances can be made. However, with non-parametric statistics it is more difficult to obtain significant results; and thus, important findings may remain undiscovered.

There is much variability in the classroom behavior of different teachers. The use of statistics veils this variability. For this reason ranges were reported in this study. It is very important to recognize that statistical conclusions do not apply to all teachers. The performances of the few exceptional teachers, which are vitiated by analysis of groups, must be analyzed.

Limitations of research on classroom interaction with the mentally retarded

(1) The use of the Gallagher-Aschner Classification System for the analysis of the teacher-pupil verbal interactions with mentally retarded children may be questioned. Some of the categories of this system were not found in this study (e.g., synthesis in divergent thinking, translation in convergent thinking). This is attributed to the

fact that they were of too high an intellectual level for mentally retarded children's verbal behavior. On the other hand, not enough categories at the lower levels of intellectual functioning were included in this system. For example, many activities for perceptual-motor development, which are important at the mental age levels of these subjects, were observed. Since most of these were of a nonverbal nature, they were generally categorized as routine, and occasionally as cognitive-memory. These activities could not be adequately analyzed within the framework of the Gallagher-Aschner System.

The lack of suitability of this classification system for the mentally retarded is attributed to the fact that it was based on Guilford's "structure of intellect" which was developed from studies of gifted adults and that it was designed for the analysis of gifted high school students.

The Gallagher system was used in the present study because it was the only reliable and seemingly valid system based on a theory of intelligence. The Taba et al. system (1964), which was based on Piaget's model of intelligence, might have been more appropriate for the mentally retarded. However, the reliability and design of the latter system mitigated its possible suitability.

For subsequent use with the mentally retarded and elementary school children, a new classification system should be constructed. Such a system might combine Piaget's and Guilford's theories so as to be more appropriate for the lower levels of intellectual functioning.

There are those who believe that interaction research should be delayed until adequate instruments are devised. However, this writer believes that such research with the mentally retarded should not be halted until such a classification system is evolved because of two reasons. First, a new classification system can only be developed from using established systems, and thereby discovering their faults and overcoming them. Secondly, it will be a long time before an adequate system for use with the retarded will be developed. It is too costly to wait for the development of such an instrument because much meaningful data can be obtained with the present systems, especially that of Gallagher and Aschner. If psychological and educational researchers were to wait for adequate instruments, no research would be conducted. It is better to have research leading to tentative conclusions than no research and no conclusions at all.

(2) A greater amount of uncodable utterances (because of technical limitations), are probably found in special classes for the mentally retarded than other types of classes. Three factors seem to be responsible for this.

First, in classes where there are discipline problems there are extremely high noise levels because of simultaneous conversations between the teacher and a student and between groups of students and because of the children's laughter and screams. Thus, in classes with discipline problems much of the verbal behavior cannot be deciphered. As previously stated, many of the classes in this study had discipline problems which resulted in a relatively large amount of uncodable teacher and student utterances (i.e., a mean of 6%).

Secondly, many mentally retarded children have articulation problems which make their utterances difficult to understand in the classroom, and impossible to understand on a tape recording.

Finally, individualized instruction causes many technical problems. When a teacher in this study individualized instruction, she would place each child in a different part of the classroom so that he could work independently with a minimal amount of distraction. She would spend one or two minutes with a child in one corner of the room, and then the next few minutes with a child in the opposite corner. It was not practical to follow the teacher with the tape recorder for such short time intervals. To the extent the teacher individualized instruction, it was not possible to adequately transcribe all of her verbal transactions.

Of these three factors, only the last seems to be modifiable to some degree. A chest microphone might be worn by the teacher. However, such a procedure seems to be more obstrusive than the one used here. Consequently, these factors will probable continue to plague research on the classroom interactions of the mentally retarded. However, the value of performing such research far outweighs the effects of these logistical problems.

Limitations of the present study

(1) This study can be criticized because only one day of classroom interaction was tape-recorded for each teacher. Thus, this sample of behavior may not have been representative. However, for each additional day of tape recording, it would have been necessary to add two more judges or an extra year for the analysis. The collection of more data was not within the limited budgetary and temporal scope of this study.

(2) One of the criticisms of Goldstein's study is applicable to the present one because his E and C groups were used. The C teachers should have received attention for a period of time comparable to the E teachers' training so that the factor of attention could have been eliminated.

(3) As previously mentioned, it is possible that there was a selection factor operative in the formation of Goldstein's E and C groups in that the teachers volunteered for each group. Since the E and C teachers were not measured before training commenced, it is possible that the E teachers were poorer than the C teachers before training. The training may have improved the E teachers to the level of the C teachers, thus making the groups equal. It must be recognized that it is practically impossible to randomly assign subjects to treatment groups in a study of this nature because most teachers will refuse to cooperate unless they can determine their group membership; however, it is possible and experimentally sound to take pre-training measurements.

Writer's Impressions

In this section the writer's impressions and speculations, some of which lack any quantifiable support, are presented. It cannot be over-stressed that the generalizations presented in this discussion pertain to most, but definitely not all, of the teachers in this study.

Quality of teaching

An evaluation of the quality of teaching pre-supposes a conception of "ideal" or "good" teaching. To minimize the amount of controversy in defining good teaching, only the three following factors are posited as necessary:

(1) The ability to manage, especially discipline, a class.

(2) The adoption of realistic long and short term goals.

(3) The planning and implementation of tactics to achieve the goals.

The writer concluded on the basis of her observations and the statistical results that most of these teachers did not know how to discipline their classes. They did not seem to exert their role as the authority figure in the class. Because of the constant disciplining in many of the classes, the classroom atmosphere seemed unpleasant to both the students and the teacher.

From the writer's subsequent contacts with these teachers, it was concluded that most of them did not have any clearly defined short or long-term goals for their classes. If they did state any goals, they were usually meaningless generalizations such as self-realization, self-sufficiency, etc.

Those teachers who had goals, did not seem to know how to plan or implement appropriate means for their accomplishment. Lessons revolved around instructions in teachers' guides, materials, etc., but not around teaching predetermined concepts.

The behavior of the typical teacher of this study was incompetent. Since it is useless to describe the nature of incompetency repeatedly, future descriptive research on teachers of the mentally retarded should be directed at the good teacher rather than the average teacher.

The few teachers judged good by the writer and consultant were able to discipline their classes, had realistic goals, and knew how to attain them. Yet, they differed in how they disciplined their classes, what their goals were, and how they sought to accomplish them. Future research must demonstrate how teachers using radically different methods and approaches can all be equally good teachers. Also, the performance of the ideal teacher must be fully described so that the typical teacher can be trained to approach the ideal.

Quality of teachers

Two traits of this group of teachers, one intellectual and the other attitudinal, impressed this writer.

The intellectual traits of this group of teachers can best be described by analyzing the intellectual processes required for the appropriate use of the inductive method. Problem solving ability is constantly involved in the use of the unductive method. The problem posed for the teacher is leading the students to the "discovery" of the generalizations or principles to be learned. One step in solving this problem is projecting various strategies and questions which eventually lead to the solution of the problem. A high level of divergent thinking seems to be required for the teacher at first stage. After projecting strategies, the teacher must logically order them so that the students can readily see relationships and reason to the desired generalization. At this second stage convergent thinking is required of the teacher. Evaluative thinking is involved in both stages, but is especially important for seeing when a strategy is not succeeding with the students and changing course. In summary, a high level of all three forms of productive thinking seems necessary for the appropriate use of the inductive method.

This view of problem solving ability as involving a combination of convergent, divergent, and evaluative thinking is based on Guilford's model of problem solving ability (1966).

From her observations of the E teachers over a period of a year, the writer seriously doubts that most of the E teachers functioned at the high levels of productive thinking required for use of the inductive method. They seemed especially limited in divergent thinking. Thus, the E teachers may not have used the inductive method because of intellectual limitations.

From her discussions with the teachers, the writer was impressed by their attitudes regarding mental retardation. Most teachers' attitudes seemed conservative in that they held limited educational goals for the mentally retarded. To them the inductive method and its basic premise--that the mentally retarded are capable of higher levels of thought--probably seemed quite radical. If this contention is true, then it is possible that the E teachers did not use the inductive method because its premises were not congruent with their attitudes.

Evaluation of present study

The writer believes that this study is important because it focuses on the teachers' behavior. If special education is to be improved and if the training of teachers of the mentally retarded is to be improved, then it is mandatory to describe teacher behavior and then alter it in the appropriate directions. Studies of the teacher-pupil verbal interaction are necessary for the eventual understanding and control of the teaching process. Only through such studies can abstract concepts such as the educability of intelligence be converted into actual educational practices. Furthermore, such research might be used as a basis for a "scientific" approach to teacher training. Hopefully, this study will be the beginning of a long series of such studies in the education of the mentally retarded.

Implications for Teacher Training

On the basis of the interpretations of the obtained results, present teacher training programs seem inadequate in producing teachers who can teach. These programs might be improved by utilizing present research and promoting future research on how teacher behavior can best be altered.

The writer proposes that the best way to change teacher behavior in desired directions seems to be through an early experientially based training program. Ideally, such a program would encompass five years, the last of which would constitute an internship. Teachers of the mentally retarded are specialists, and like all specialists, need an internship.

The stress in such a program would have to be on teaching methods as well as curriculum and materials. But first, considerable attention to management problems must be provided so that teachers can eventually implement methods and curricula.

The process of teaching would be stressed throughout the five years. Stress on these aspects of the teaching process would be given:

1. Practice in constructing long and short term educational goals for various groups of retarded children.

2. Selection of various classroom strategies to achieve these goals.

3. Implementation of various strategies.

4. Assessing the outcomes of the various strategies and goals.

Analysis of and practice with different types of questioning approaches would be involved in the selection and implementation of various strategies.

However, before teachers can be given such practice, they must be provided with live models of optimum teaching behavior. Then they can imitate and model their own behavior after that of the "ideal" teacher.

The writer believes that the future of special education of mentally retarded children lies in the development of better teacher training programs which, in part, relies upon studies of the teaching process and the teacher-pupil verbal interaction.

CHAPTER VI

SUMMARY

Statement of the Problem

The three objectives of this study were to: (1) describe teacher-pupil verbal interactions in special classes for the mentally retarded with special reference to how the teacher uses her language to promote productive thinking in her students, (2) to compare teacher-pupil verbal interactions of teachers instructed in the use of a teaching method designed to enhance productive thinking in the mentally retarded (i.e., the inductive method) with teachers using other methods, and (3) to investigate the effects of teacher and student background characteristics on the teacher-pupil verbal interactions in special classes for the mentally retarded.

Background of the Problem

Theoretical framework

Guilford's "structure of intellect" (1965) was adopted as the theoretical framework of this study because it provided a systematic, comprehensive model of cognitive functioning. For the purpose of this study productive thinking was defined as Guilford's convergent, divergent, and evaluative thinking. The teacher's attempts at modifying her mentally retarded pupil's intelligence were equated with her attempts at enhancing his productive thinking.

Research on classroom interaction

The dimension of classroom interaction that has been studied most frequently and most successfully has been the social-emotional climate (Medley and Mitzel, 1963). Recently much attention has been directed at the cognitive aspect of classroom interaction.

Smith and Meux (1963), who conducted the first study in this area, studied the logical operations of teaching. Taba, et al. (1964) used Piaget's model of intelligence to study the pedagogical functions and levels of thought involved in classroom interations. Bellack, et al. (1965) has described the cyclical patterns of the teacher-pupil verbal interaction. Gallagher (1965) used the Gallagher-Aschner Classification System, which was also used in the present study, to study the teacher-pupil interactions in special classes for gifted high school students. Cawley and Chase (1966) have used the Gallagher-Aschner System with special classes for the mentally retarded.

Research on teaching methods

More than any other method, the inductive teaching method has been advocated as a means for educating intellectual abilities. Goldstein (1963) has advocated the use of this method with the mentally retarded as he believes that it can aid in the development of independent thinking. Goldstein's inductive method was the teaching method employed in the comparative aspect of this study.

The inductive or E method was described as differing from other or C methods on these two major factors: (1) with the E method a problem solving situation is created, while a fact dispensing situation is found with the C methods; (2) with the E method the teacher asks the student to evaluate his incorrect responses, and then re-respond, while with the C methods the teacher provides correcting responses.

Teacher and pupil background characteristics

Although it has been recognized that the characteristics of the teacher and pupil influence the classroom interaction, little research has been directed at studying the effects of these characteristics. The teacher characteristics of age, teacher preparation, and professional experience and the student characteristics of C.A., I.Q., and M.A. were investigated in this study.

Hypotheses

Eleven hypotheses were proposed: three for the description of the teacher-pupil interaction; seven for the comparison of the E and C methods; and one for the investigation of student characteristics. These hypotheses are presented in the results section.

Method

Sample

Seventeen teachers of special classes for the mentally retarded in New Jersey served as subjects for the teacher sample. The nine E teachers were given 32 training sessions on the inductive teaching method and an experimental curriculum. No training was given the eight C teachers. The 167 mentally retarded pupils of these 17 teachers comprised the student sample.

Procedure

Each class was tape-recorded for one full day. The tapescripts were analyzed with the Gallagher-Aschner Classification System by two judges. A coefficient of agreement of .80 was obtained for the two judges.

Results

Description of the teacher-pupil verbal interaction

The following three hypotheses were proposed to investigate the descriptive aspect of this study.

Hypothesis I: The distribution of the teachers' questions in order of greatest frequency will be cognitive-memory, convergent thinking, and then equal amounts of divergent and evaluative thinking. Confirmed only for the cognitive-memory category.

Hypothesis II: The average amount of cognitive-memory questions asked by the teachers will be significantly greater than 50% of all questions asked. Confirmed.

Hypothesis III: There will be a significant positive correlation between the thought processes requested by the teachers and what is supplied by their mentally retarded pupils. Confirmed.

In summary, an analysis of the teachers' questions indicated that these teachers stressed cognitive-memory areas, almost to the exclusion of productive thinking. The results for teacher statements showed that these teachers were pre-occupied with management and routine problems.

Comparison of the E and C teachers

Seven hypotheses were proposed to determine whether the E teachers were behaving in the manner described by Goldstein.

Hypothesis IV: The E teachers will ask significantly more questions involving productive thinking than the C teachers. Not confirmed.

Hypothesis V: The E teachers will ask significantly more conclusion questions than the C teachers; while the C teachers will give significantly more conclusion statements. Not confirmed.

Hypothesis VI: The C teachers will utter significantly more questions and statements in the factual subcategory than the E teachers. Not confirmed.

Hypothesis VII: The C teachers will provide significantly more correcting responses after the students' incorrect responses than the E teachers. Not confirmed.

Hypothesis VIII: The E teachers will ask for significantly more evaluations after the pupil has incorrectly responded than the C teachers. Not confirmed.

Hypothesis IX: There will be greater consistency for the E teachers' questions during the course of the school day irrespective of subject matter area than for the C teachers. Not confirmed.

Hypothesis X: There will be no significant differences between the E and C teachers' statements in the primary categories. Confirmed.

From these results it can be concluded that the E teachers were not using the inductive teaching method, but were using the same methods as the C teachers.

Investigation of teacher and pupil background characteristics

Of the teacher characteristics of age, teacher preparation, and experience, only the last was found related to the teacher-pupil interaction, and this was limited to the nature of the teacher questions.

To determine the effects of the students' characteristics on the teachers' performance, these were correlated with the interaction variables. In hypotheses XI a significant negative correlation between the amount of binary questions asked by the teacher and the mean I.Q. of the class was predicted. Since no significant correlation was obtained, this hypothesis was not supported. The amount of positive reinforcement given by the teacher was significantly correlated with the mean I.Q., M.A., and C.A. of the class.

Significant correlations for I.Q. and M.A. with the amount of productive thinking expressed in the class were obtained.

Discussion

Description of the teacher-pupil verbal interaction

Four explanations for why the teachers asked so many cognitive-memory questions and so few productive thinking questions were proposed.

1. The teachers could not recognize differences between various types of questions.

2. The teachers could discriminate between various types of questions, but they could not incorporate these differences into their actual questioning behavior.

3. The teachers believed that their mentally retarded pupils were not yet "ready" for productive thinking.

4. The teachers believed that their mentally retarded students were incapable of doing any productive thinking.

Comparison of E and C teachers

Four explanations for why the E teachers did not use the inductive method were proposed:

1. The training given was inadequate because it primarily consisted of lectures and no models of and practice with the inductive method were provided.

2. There was a selection factor in the formation of the E and C groups because the teachers volunteered.

3. These teachers were too rigid to change their behavior.

4. The teachers may have used the inductive method with their retarded pupils at one time, but they had found that it was unsuccessful so they stopped using it.

Investigation of teacher and pupil characteristics

Teacher characteristics. Age and teacher preparation were not related to the teachers' verbal interactions. Teacher questions were the only aspects of the classroom interaction related to teaching experience. Teachers probably learn through experience that their questions are the most critical factors of their teaching behavior. Divergent thinking was the only area of productive thinking not correlated with teaching experience with the retarded. This was attributed to the following factors: divergent thinking is a new area in education and this may be the hardest type of question to learn to ask without supervision.

Student characteristics. There are three explanations for why the teachers' questions were not correlated with the students' intellectual levels.

1. The use of group means was inappropriate because the teacher does not generally work with the full class

simultaneously and because the teacher probably teaches to the lowest, and not the average, child.

2. The teacher is probably affected by her perceptions of the students' intellectual levels and not objective measures of them.

3. The ranges were too constricted for the teachers to have to alter their level of questions.

The finding that the students' I.Q.'s and M.A.'s were correlated with their level of classroom expressiveness was at variance with the Taba et al. study (1964).

Limitations of the Study

Limitations of research on classroom interaction

Three problems are found in all types of studies on classroom interaction.

1. There are no refined classification systems presently available.

2. Inferring the underlying process is difficult, and sometimes impossible.

3. Present statistical methods, especially parametric statistics, are inappropriate.

Limitations of research on classroom interaction with the mentally retarded

There are no classification systems that fit the classroom interactions of mentally retarded children. A large amount of uncodable units are obtained with classes for the mentally retarded because of the high incidences of discipline and articulation problems and because of individualized instruction.

Limitations of the present study

Three limitations of the present study were noted.

1. Only one full day of tape recording was taken for each teacher.

2. No attention was given the control group so as to eliminate the effects of attention.

3. There may have been a selection factor in the formation of the E and C groups.

Writer's Impressions

The quality of the teaching observed by the writer was rated as poor. This was substantiated by the statistical results.

Two qualities of the teachers, one intellectual and the other attitudinal, impressed the writer. It was questioned whether the teachers functioned at a high enough level in productive thinking to use the inductive method appropriately. The teachers' attitudes toward the education of the mentally retarded seemed conservative. Thus, the inductive method may have seemed radical to them.

Implications for Teacher Training

From the results of this study, an early, experientially based teacher training program seems to be indicated. The writer believes that studies of the classroom interaction with the mentally retarded are of utmost importance for the improvement of the training of special class teachers and for the education of the mentally retarded.

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APPENDIX A

A Summary of the Primary and Secondary Categories of the Gallagher-Aschner Classification System

(Adapted from Aschner, Gallagher, Perry,
Afsar, Jenne, and Farr, 1965)

I. Routine (R)[a]

This category includes routine classroom procedural matters such as management of the classroom, the structuring of class discussion and approval or disapproval of the idea or the person.

A. MANAGEMENT has to do with the mechanics of the class session (e.g., assignments, closing and opening remarks, etc.).

1. Question (Mq): Requests or invitations to speak calling for questions.
2. Procedure (Mp): Announcements or procedural instructions, given or requested for individuals or the group as a whole.
3. Aside (Mas): Incidental or parenthetical comment; gratuituous content.
4. Nose-counting (Mnc): Calling for or responding with a show of hands for a tally or canvas.

[a] Letters in parentheses represent abbreviations used by judges in coding tapescripts.

5. Feedback (Mfb): Request for or response with signs from group as to whether or not the speaker's actions or remarks are clearly understood.

6. Work (Mw): Non-verbal actions or seatwork going on in connection with current discussion or class proceedings.

7. X - Unclassifiable response primarily due to technical recording difficulties.

B. STRUCTURING includes conventional engineering moves which shape in advance the content of subsequent activity.

1. Self-structuring (Sts): Conventional prefactory move to signal content and purpose of one's own next remarks or behavior.

2. Structuring Other (Sto): Engineering next speech or actions of other(s). Monitoring other's performance. Pump-priming to keep discussion going on a point already before the class.

3. Structuring Future (Stf): Forecast of future activity, study, learning, etc. beyond this particular class session.

4. Class Structuring (Stc): Focusing class attention on point to be emphasized or taken up; laying groundwork for question or problem; probing, pushing, adding data for bogged-down class (teacher only).

C. VERDICT is a pronouncement on the deportment and/or quality of academic work.

1. Verdict (+ or -) (Ver): Impersonal praise or reproach on quality of academic performance of individual or group.

2. Personal Verdict (+ or -) (Verp): Personal praise or reproach of individual (occasionally by teacher on whole class). Negative verp generally on deportment.

D. AGREEMENT (Agr) involves accepting or rejecting content; conceding a point; not permission-giving nor procedural.

E. SELF REFERENCE (S) deals with the speaker's personal report or comment upon or about self. This may be a conventional device or cautionary tactic.

F. DUNNO (Du) represents an explicit indication that one does not know.

G. MUDDLED (Mu) shows that a speaker is confused, mixed up, or flustered.

H. HUMOR (Hu) includes remarks of evident witty, humorous, or comic intent and responses (usually laughter) to same.

II. Cognitive-Memory (C-M)

C-M operations represent the simple reproduction of facts, formulas, and other items of remembered content through use of such processes as recognition, rote memory, and selective recall.

A. SCRIBE (Scr) involves the giving of a spoken or written spelling or exemplification of a word or expression.

B. RECAPITULATION represents going over or returning to something that was previously said, done, read, or witnessed.

1. Quoting (Req): Rote recitation or literal reading from text, paper or notes in hand.
2. Repetition (Rep): Literal or nearly verbatim restatement of something just said.
3. Recounting (Rec): Narration of past extra-class occurrence.
4. Review (Rev): Recitation of material which occurred or was discussed in current or past class session.

C. CLARIFICATION represents a restatement of something said for the purpose of making the original statement clearer, more explicit, or more precise.

1. Clarifying meaning (Clm): Rendering a previous

statement more intelligible either by (a) restating or rephrasing or (b) adding informative details.

2. Clarifying qualification (Clg): Rendering a previous statement more accurate either by (a) "entering a rider" upon the remark or by (b) entering an explicit correction.

D. FACTUAL performances include statements or citations of one or more items (ideas, facts, events, etc.) whose status is accepted and treated in the discussion as a matter of fact.

1. Fact Stating (Fs): Requests for or recitations of items taken to be matters of fact.

2. Fact Detailing (Fd): Spinning out further a prior assertion of fact or other statements in which factual items were mentioned.

3. Factual Monologue (Fm): Reporting of factual material in the form of a monologue during which verbal exchange is conventionally excluded.

III. Convergent Thinking (CT)

Convergent thinking includes thought operations involving the analysis and integration of given or remembered data. These operations lead to one expected result because of the tightly structured framework which limits them.

A. TRANSLATION (Tr) involves a shift of conceptual material from symbolic or figural content to semantic content, or vice versa.

B. ASSOCIATION (As) involves likenesses and differences; degrees of comparison; classifications, etc.

C. EXPLANATION (Ex) deals with events and activities--with causes and effects, processes and procedures related to given results or outcomes.

1. Rational Explanation (Exr): Asking or telling why X is the case, why Y caused X, etc. Substantiating a claim or conclusion by citing evidence.
2. Value Explanation (Exv): Asking or telling why X is good, bad, useful, important, etc. Justifying a rating, viewpoint, or value based judgment by giving reasons why.
3. Narrative Explanation (Exn): Step-by-step account of how something is done, how a mechanism works, or of what led up to an event or given outcome.

D. CONCLUSIONS call for or state some point that may be derived from or follow logically from the array of points that had been treated in the foregoing discussion.

1. Generalization (Gen): Integration of prior remarks by slightly more general reformulation.

2. Summary Conclusion (Cons): Summary reformulation, often serial or enumerative, of material treated in discussion or reading.

3. Logical Conclusion (Conl): Calling for a deductively drawn implication from material presented.

IV. Evaluative Thinking (ET)

Evaluative thinking deals with matters of value rather than matters of fact and is characterized in verbal performance by its judgmental character.

A. UNSTRUCTURED evaluations occur when the speaker is not restricted on the dimension being judged and/or limited as to the choice of the dimension on which the evaluation takes place.

1. Unstructured Rating (Ura): A value judgment produced or requested on some item or idea in terms of a scale of values provided by the respondent.

2. Unstructured Judgment (Uju): A value judgment produced or requested on some idea or idea wherein the value dimension has already been provided.

B. STRUCTURED evaluations occur when the person doing the evaluating has been presented with a limited range or scope for his judgments.

1. Structured Probability (Svp): An estimate or speculative opinion is given or requested as to the likelihood of some occurrence or situation.

2. Structured Choice (Svc): Speaker calls for or declares his position as a choice between alternatives (not between yes or no answers).

C. QUALIFICATION represents the expression of disagreement with established values previously expressed in the class situation.

1. Qualified Judgment (Qj): An offer or request for a rider or modification to a prior value judgment. Also, attempts to make more precise the value dimension discussed.

2. Counter Judgment (Q-c): Speaker declares a directly opposed position with respect to value statement of a previous classroom speaker.

V. Divergent Thinking (DT)

In a divergent thinking sequence, individuals are free to independently generate their own ideas within a data-poor situation, often taking a new direction or perspective.

A. ELABORATION (El) involves building upon a point already made; filling out or developing a point, but not shifting to a new point, often by concocting instances or examples. Structured or free (S or F).

B. DIVERGENT ASSOCIATIONS (Ad) involves the construction of a relationship between ideas, casting the central idea into sharper and often unexpected perspective, by comparisons, analogies, etc. (S or F).

C. IMPLICATIONS (imp) deal with extrapolations beyond the given, projection from given data--typically by antecedent-consequent or hypothetical construction--to new points of possibility (S or F).

D. SYNTHESIS (Syn) pertains to spontaneous performance, tying in, integrating the current central idea with an entirely new point or frame of reference. May be a variation or reversal of a previous conclusion.

Double Paired Ratings: The complex nature of verbal classroom interaction often requires the combination of more than one of the above described categories.

APPENDIX B

Codings Added to the Gallagher-Aschner Classification System

To test some of the hypotheses of this study it was necessary to add several categories to the Gallagher-Aschner Classification System.

Teacher requests for the evaluation of a student's incorrect response were represented by the abbreviation (Ev) after the teacher's question. The source of the correct answer to the question being evaluated was notated by (S) if the same child who evaluated the response gave the correct response, by (o) if the correct answer was given by another child, by (T) if this was done by the teacher, and (NA) if the correct answer was never given.

If the teacher gave a correcting response, this was shown by (RR) after the Gallagher-Aschner category for the teacher's statement.

All student responses to cognitive-memory, convergent thinking, and divergent thinking questions were scored as correct (+) or incorrect (-). Evaluative thinking responses were not included because opinions and speculations could not be scored in this manner. The quality of divergent thinking responses was not considered in the decision of right and wrong, but only relevance to the question.

APPENDIX C

Samples of Teacher-Pupil Interactions Demonstrating the Inductive Method

Samples of teacher-pupil interactions have been selected to exemplify certain aspects of the inductive method. For the purpose of expediency, the following excerpts have been condensed so as to highlight only the inductive method.

If the teacher uses the inductive method, she should be asking productive thinking questions. Therefore, samples of interactions involving each of the three types of productive thinking questions are presented. One of the most critical aspects of the inductive method is the teacher's request for the student to evaluate his incorrect response and to re-respond. Examples of this aspect of the inductive method are also provided.

The following teacher-pupil interactions have been taken from a social studies unit on the neighborhood. The purpose of the lesson from which these interactions were selected was to teach those jobs in the neighborhood that mentally retarded children can hold.

The following interaction illustrates divergent thinking as the teacher's questions allow for a variety of possible responses which the students provided. Each of the questions followed by an asterisk represents a divergent thinking question.

T: Now today we're going to talk about how we can help in the neighborhood. What's something you can do in the neighborhood? Think of all the jobs boys and girls like you can do in the neighborhood.*

S: Go to the store for people.

T: Yes, right. That's a good idea. What else?

S: Deliver food.

T: Oh, from a supermarket. That's a good idea.

S: Deliver papers.

T: Newspapers. Isn't that a good job! What else could you do?

S: Help your mother.

T: What are some of the ways you can help your mother?*

S: Do jobs for her.

T: Like what?

S: Rake up the leaves in the yard.

S: Take the garbage out. Sweep the floor. Make the beds.

T: Good. What else?

The following interaction involves the teacher's request for the student to evaluate his incorrect response and to re-respond.

S: You could drive her to the store.

T: Could you drive your mother to the store?

S: No.

T: Why not?

S: I can't drive.

T: How can you help your mother when she goes to the store?

S: You can help her carry packages.

T: Yes. You can help her carry packages.

The following discussion of the responsibilities of the job of baby-sitting involves both divergent and evaluative thinking. The teacher's question requires divergent thinking because the students must list all the aspects of baby-sitting. Evaluative thinking is involved because the teacher is asking the students to rank these aspects and select the one that is most important.

T: What is the most important thing to remember when you are taking care of a little boy or girl outside?

S: Not to let him run into the street.

S: Don't let him eat dirt.

The following question involves convergent thinking because the teacher is asking the students to explain or justify their evaluation of the most important aspect of baby-sitting.

T: Why is that important? Why shouldn't you let the child run into the street?

S: Because he might get hit by a car and die.

T: Good. And why shouldn't you let the child eat dirt?

S: Because it's dirty.

T: Well, what other reason might there be?

S: Dirt makes you sick.

T: Right. Good.